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Electrical World

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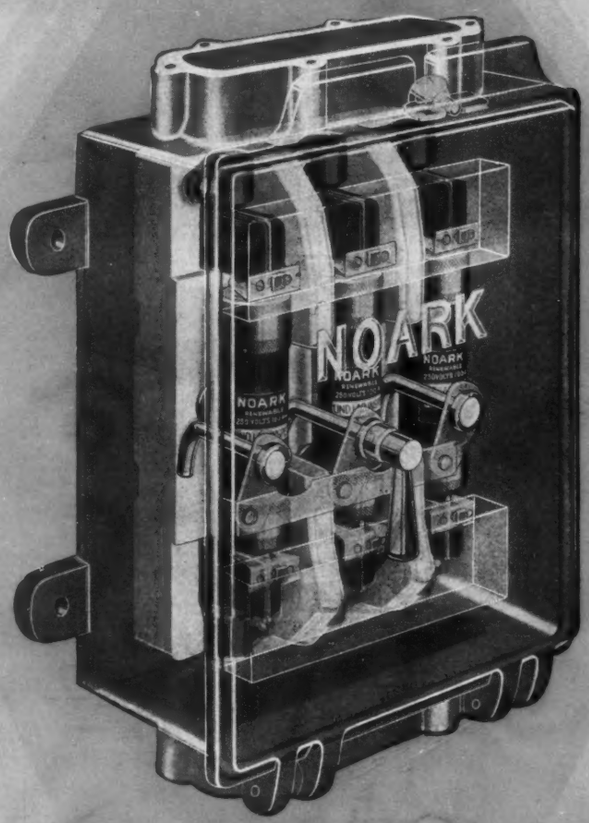

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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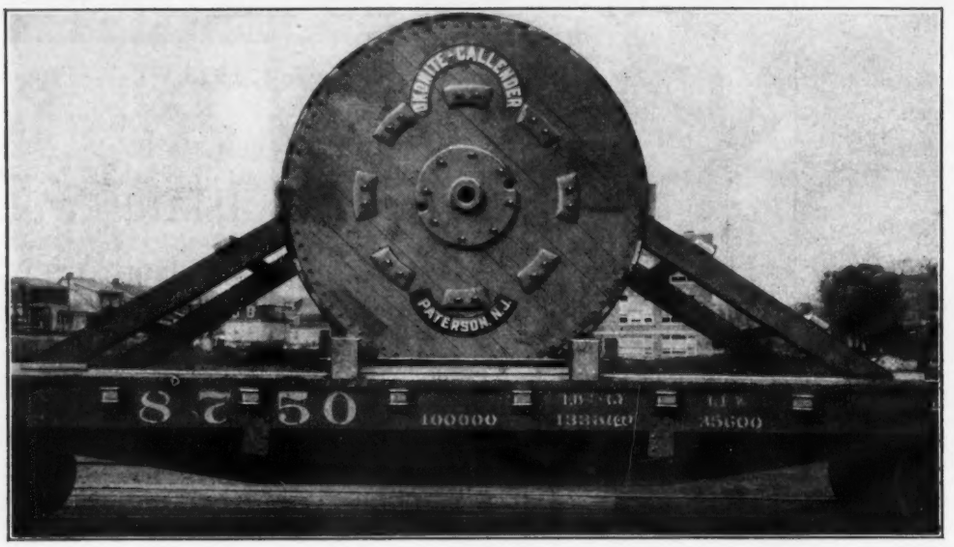
A FEW copies of the following reprints of statistical data are still available for distribution. The dates indicate the issues of the Electrical World in which the material was originally published. Requests should be addressed to the Statistical Editor.

Summary of 1925 Census of Electrical Manufacturers (April 30, 1927).
Number of Cities and Towns Served by Electricity, by States and Population Groups (June 12, 1926).
Summary of Central Station Statistics for 1926 (Jan. 1, 1927).
Prime Movers, Generators and Motors in American Manufacturing Plants (Aug. 13, 1927).
Industrial Load of the United States (Jan. 2, 1926).
Similar compilations for individual geographical regions are also available.
Municipal Plants in the United States—Statistical Summary (Nov. 17, 1928).

OKONITE CALLENDER



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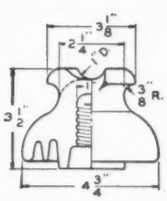
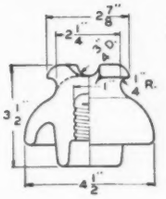
1878 OKONITE QUALITY STANDARDS – *Unchanged for Half a Century* 1928

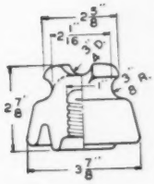
Three Popular Styles

Lapp Distribution Insulators

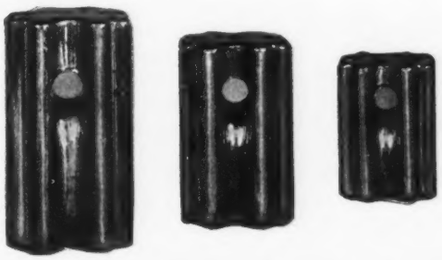
LAPP VACUUM PROCESS PORCELAIN







Insulator No.	6184	6186	6188
Line voltage	17000	13200	8000
Arcover distance, inches	4.5	4.6	3.5
Dry arcover voltage	62000	67000	60000
Wet arcover voltage	47000	45000	42000
Leakage distance, inches	7.4	6.2	4.6
Strength, lbs.	3000	3000	3000
Min. height pin, inches	5	4	4
Net wt., each, lbs.	2.0	1.7	1.3
Packed wt., each, lbs.	2.5	2.2	1.6
Standard package	50	50	50
Cubic feet, per 1000	70	70	40



How about Guy Insulators?

No.	*Dia.*	*Length*	*Hole*
5450	3"	3 5/8"	5/8"
5451	3 1/2"	5"	3/4"
5452	4"	6 1/4"	7/8"

There are no better insulators than Lapp insulators. Every piece is produced from Lapp Vacuum Process porcelain, free from blebs, laminations and other common defects.

LAPP INSULATOR CO., LEROY, N. Y., U. S. A.

$49,000 saved in line clearing in this town

Previous tree difficulties prevented the wire company serving this city from rebuilding its lines. Public confidence in Davey Tree Surgeons solved the problems

After city officials and the citizens had refused, Davey Tree Surgeons secured the necessary permissions for line clearing and the work was done at a saving of nearly $49,000 to the wire company

THIS community happened to be on a through line and it became necessary to rebuild in order to handle the increasing traffic. The existing wires would handle the local service, but could not carry the business of the main line.

Previous difficulties with reference to the street trees caused the city officials and the citizens to refuse permission for the wire company to do the necessary trimming in connection with the rebuilding program. Public opinion was adamant.

Therefore the wire company prepared plans to build its main line entirely around the town at an estimated cost of $50,000.

Then they requested the local Davey representative to ascertain whether the situation could be handled through Davey Tree Surgeons. The necessary permissions were secured, and the line clearing work through the town was done by Davey Tree Surgeons at a cost of $1100, with a saving of nearly $49,000 to the wire company.

Nothing except public confidence in the skill and reliability of these trained experts made this possible.

Of course, this is an unusual case, but nevertheless it is a real one. It only serves to show the broad character of service that Davey Tree Surgeons are rendering to wire companies in connection with the troublesome tree problem.

As a matter of fact, Davey Tree Surgeons do infinitely more than the mere physical work of providing the necessary line clearance—and this they do at surprisingly low cost.

They secure permission for the tree trimming in almost innumerable cases where the wire companies cannot secure it for various reasons. The mere fact that the work is to be done right by these reliable, nationally known experts, makes it possible.

They leave the public satisfied because they do no unnecessary cutting, never mutilate the trees, preserve the beauty and symmetry as far as possible, protect the wounds from decay, never use injurious climbing spurs, and handle their work on a professional basis.

They reduce the cost of future work in many cases by their methods of doing the work and by training the trees away from the wires.

They prevent damage claims and lawsuits—not a single one has resulted up to date.

They lift from the officials and employees of the wire companies this heretofore vexing problem with reference to a special kind of work that does not normally relate to the utility business.

All of these things at no extra cost.

Over nine hundred experts available

This service is offered anywhere in the eastern half of the United States from Boston to beyond Kansas City, and from Canada to the Gulf.

Wherever possible this work ought to be done when the trees are dormant for reasons that are important to you. Write now for full information so that arrangements may be made to serve you at the proper time. Representatives are located in all important cities.

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Public Works Reserve Fund Advocated

GOVERNOR BREWSTER of Maine calls for a three-billion-dollar public works reserve fund to be drawn upon in times of depression. His recommendation has met with a great deal of favorable comment, but the practical application of the principle must be studied carefully. The total government, state and municipal outlay for public works is about $1,000,000,000 a year, and a fair estimate is that only about $350,000,000 of this could be allotted to a long-range construction program and therefore be used as a reserve to be expended in bad times.

The government might well have a great deal of flexibility in spending for irrigation, flood control, the development of certain waterways and the construction of public buildings. The state expenditures for highways and state works are less flexible, and municipal expenditures are current necessities and still less subject to postponement. Serious consideration must be given, therefore, to the detailed operations necessary in establishing a reserve fund of the magnitude suggested. The idea is splendid, and to the fullest economic degree it should be developed into a practical working program. The problems introduced by depressions are serious and affect every industry as well as the public. The Brewster proposal should be studied constructively.

* * * *

Growth of Investment Trusts

ONE of the outstanding features of the stock market during the past year has been the strength and stability shown by the utility stocks. The continued growth in output and earnings of the utilities is largely responsible for the rise in the value of these securities, but the formation of new investment trusts and the expansion of others already in existence have also had much to do with the situation. These trusts are acquiring, principally for long-term investment, securities of various kinds, but chiefly the common stocks of successful and progressive public utility companies. The securities of a picked list of electric utility companies will be found listed among the investments of almost all the investment trusts, and, following the law of supply and demand, these stocks have enjoyed phenomenal rises on the market. Of course, with such admitted indorsement of the value of public utility securities, the public has also shown an interest in utility stocks, with the result that electric light and power securities are in high favor among professional as well as non-professional buyers.

The investment trust, although relatively new in the United States, is destined to play an important part in stabilizing utility markets. While the specific purposes for which it is designed are economically sound, the character and ability of the men behind them are the best safeguard, although, in the absence of any regulation, certain restrictions are usually adopted to assure safety of the investor's funds. Of course, the main advantage of these trusts from the investor's viewpoint is the great diversity represented in their investments, but with the limited supply of utility stock it is also apparent that purchases may command exorbitant prices. While this is a disadvantage to the investor, it is an advantage to the utility company in that it provides a good and competitive market for utility securities and makes for greater financial stability. During the year it is safe to say that investment trusts have absorbed more utility securities than the public. To them, therefore, is chiefly due the present enhanced market value of public utility securities.

* * * *

Utility Commissioners Report on the Industry

SOME very competent reports on the light and power industry were made by the committees of the National Association of Railroad and Utilities Commissioners at the New Orleans meeting. Not all utility men will agree with the conclusions in these reports, but all will agree that an able group of regulatory officials is hard at work in an endeavor to develop and establish the best possible principles of utility regulation.

An interesting analysis showed that the trend of all costs of generating and distributing electric power over a fifteen-year period has been downward, that the cost margin between large and small utility systems has contracted noticeably, that the costs of distributing systems are about the same for all properties and are independent of size of system, that generating costs are the largest single cost item, and that the cost advantage of the larger system is derived largely from reduced generating costs. The committee might well have pointed out the trend toward increased cost in distribution for all systems and the improved thermal and cost efficiency of comparatively small generating plants whereby the cost margins between large and small systems are being reduced still further. Through better load factor, use factor and diversity factor the large systems generally reduce costs, but even these factors are not inherent functions of the size of system.

Some fundamental conclusions proclaimed at the convention were the belief of the association in private ownership and operation of utilities, opposition to the invasion in any manner by the federal government of the rights of the states in the control and regulation of public utilities, insistence that a rate base for utility properties must be arrived at by studying all cost elements and

theories, and statements that the research and safety activities of utilities are in splendid shape.

In so far as possible, one committee reported, all holding companies should be defined as public utilities when their operation affects the activities and control of operating companies, and the utility industry was asked to aid in developing the business in this direction. W. A. Prendergast, chairman of the New York Public Service Commission, said there should be regulation of contracts for service between holding and operating companies and that the stubborn opposition of the industry to holding-company regulation did not create public confidence. Basic to any holding-company activity, however, is state commission control of subsidiary operating properties. A proper regulatory act in each state with adequate enforcement indirectly controls all holding-company operations, because the operating properties are directly controlled and regulated. This principle, if applied, answers the problem of holding-company regulation.

State utility commissioners are able men who have done much to develop the industry. They deserve the support of the industry because state regulation will continue only to the degree in which it meets future conditions as well as it has those of the past. It can meet future needs only if it earns the whole-hearted support of the public through the services rendered, and it is to the interest of the industry and of the commissioners that these services be the best possible. State regulation is not a job for commissioners only; it is a job for the entire utility industry.

* * * *

Trends in Engineering Education

BACK in 1861 Herbert Spencer said the function of education was to prepare people for complete living. This goal is still sought by all educators. Last week Dr. Harvey N. Davis, upon the occasion of his inauguration as the president of Stevens Institute, advocated for engineering schools one fundamental, unspecialized curriculum including an appropriate share of the humanities. He believes in giving engineering students courses in history, government, economics, literature, psychology, philosophy, ethics, and even music, painting and other arts of expression. He restates the Spencerian principle in modern terms, and his curriculum is an ideal for the education not only of engineers but of all the youth of the land who seek education to enter engineering and business.

The Davis philosophy of engineering education is indicative of the times. It embodies the essential ingredients needed by engineers to measure up to their opportunities and obligations in the modern world, for which they are largely responsible. It establishes the foundation upon which to build other Hoovers. It points the way to objectives in education beyond those of material power and the development of "go-getters." It makes keys to success out of culture instead of gold.

A fundamental training in science and in the basic principles of engineering provides the necessary technical values in a course for all engineering students. Specialized curricula and labels have served their purposes in the schools. Even in industry it may be questioned whether there is need for so many kinds of engineering labels. But specialization in technical education clearly belongs in the graduate school.

Economics and the humanities now are found in virtually all engineering curricula, although not so completely as is suggested by Dr. Davis. Educators will agree to the value of all the subjects suggested, but in a four years' course there is a limit to the number of things that can be taught and to the time that can be devoted to each of them. Every engineer would be a better engineer for having had six or eight years' educational training. Unfortunately, economic prohibitions exist to prevent the large majority of students from following this path. Some few schools have established a graduate-school basis for engineering to meet the need of the exceptional minority who can devote eight years to education; but the majority of engineers will continue to prepare for their profession in a four years' course made up of the best-balanced curricula along the lines Dr. Davis advocates that educators can devise.

The engineer is responsible for the material wrought and the power employed in this age and he must assume social, political and management responsibilities. His knowledge and his contributions must build for human welfare as well as for technical progress. So long as the schools have men of the vision and ability of Dr. Davis there need be no fear of the future.

* * * *

Economics and the Use of Fuel

"THE dominant note of these meetings is scientific rather than industrial," said W. C. Teagle, president of the Standard Oil Company of New Jersey, in his address to the second International Conference on Bituminous Coal. This is indeed a viewpoint not to be overlooked in evaluating the sessions. The scientist is usually an indeterminate interval in advance of the practical application of his ideas. It may be tomorrow or it may be one year, two, ten or fifty before industry can or needs to adopt the results of his far-sighted imaginings and experiments and apply them to dollar-and-cents processes. The essential spirit of the great gathering at Pittsburgh of scientific men from many of the great nations of the earth was a recognition of the basic value of coal, not as a raw, heat-producing material, but as a source of solid fuel, gas, chemicals, oils and even rubber. Bituminous coal is to the majority of these men a thing to be conserved and used wisely and sparingly as an irreplaceable inheritance of mankind as well as a source of essential materials.

Low-temperature carbonization of coal has been accomplished for several desired purposes. Commercial plants are in operation. Research abroad has led the way, yet C. H. Lander, director of the British Fuel Research Board, uttered a warning against groundless optimism as well as unnecessary pessimism regarding this process. The future holds bright promise for some fuel-consuming plan which will permit the generation of steam in power plants as part of fuel processing while at the same time valuable chemical by-products may be obtained, gas for industrial domestic purposes derived, and heat wastes minimized through the co-ordination of the treatment and uses of raw coal. There is a promise, though not a contract soon to be effective, that the coal car will be replaced with the electric line and the pipe line.

Utility men will do well to observe this growing trend with thoughtful interest, but there are far too many details and economic fundamentals still to be adjusted for users of great quantities of coal to be either unduly hopeful or unduly apprehensive of the immediate future. Low-temperature carbonization and the complete processing of fuel is neither an idle dream—for it is being effected with varying success—nor yet is it a factor about to overturn the engineering world; it will, with concomitant refinements, slowly prove itself, technically, eco-

nomically, satisfactorily. We must pay earth's price for what science gives us, and that price is essentially a matter of profit and loss, important though conservation may be in the eyes of those who are broad-minded enough to be concerned about posterity.

* * * *

Combining New England's Power Resources

PROF. PHILIP CABOT'S suggestion on another page that New England's power resources might be economically combined and co-ordinated through the formation of a holding company to control the operating units of the six states concerned gives voice to an idea which has received not a little consideration of late in private conversation among forward-looking utility men. If the Northeast were virgin territory from the standpoint of electrical development, there can be no doubt that the use of the regional holding-company plan, or perhaps the use of a single operating company with franchise rights in each state, would be seriously advocated by the promoters. The true situation is so at variance with this conception that the problem of regional power-company co-ordination bristles with unsolved questions which must be answered before such a plan as Professor Cabot's can get under way in any real sense of the word.

Electrical New England is in transition from an era of independent to one of centralized management. Relatively few of the larger operating companies remain unaffiliated with management groups, although these "independents" include some of the most prosperous and well-run properties of the region. Some half-dozen investment or holding corporations have gathered majority control of a long list of subsidiaries, and for the most part the identity of these last has been maintained so effectively that the consumer still deals with the company which has served for many years the area in which he lives and works. Finance and operation, on the other hand, have in many cases been revolutionized.

How long New England's independent companies will continue in financial bachelorhood is beyond even a Yankee guess. Among the leaders of utility opinion in the Northeast can be found keen and experienced minds who remain to be convinced that holding-company management is superior to independent conduct of affairs. To such the holding company has not been in use long enough on a large scale in this territory to make clear its economic advantages over capable single-company control and administration.

The pooling of power resources which the professor commends as a regional development of great economic value is making steady progress, both through operating agreements of independent utility groups and through the advance of holding-company control. The value of the well-conducted holding company has been thoroughly established in principle and in practice, but in densely populated regions and widely flung industrial areas categorical assertion that this method offers the best solution of the problem of delivering power at minimum economic cost demands thorough investigation along legal, financial, engineering, commercial and operating lines. Professor Cabot makes no assertion that the single holding company is the only key to future electrical development in any region, if he be correctly interpreted; but in painting a picture of the possibilities in bold strokes he has produced an interesting perspective.

Better Times for the Wholesalers

AT THE recent winter convention of the National Electrical Wholesalers' Association one impression was uppermost. The jobbers are feeling more prosperous and optimistic right now than for a long time. It was clearly apparent. It was general. It was good evidence that the wholesale distribution processes of the electrical industry have achieved some measure of adjustment to the changing times, that the distributors have solved for themselves some part of the difficulties that have been besetting them these many years. It was a good convention with the most interesting program for some time.

Undoubtedly, the wholesalers of electrical equipment and supplies have faced one issue pretty squarely and gone some distance to meet it. They have recognized the new competitive conditions that have demanded more convenient warehousing facilities in every large community to provide for the increasing volume of small-order business. Improved transportation conditions have brought a revolution in the buying habits of American business since the war. Retailers and contractors do not stock as heavily as of yore, and so the electrical wholesaler has had to open more branch warehouses to give a better local service. He has had to reduce his territory and make a more intensive effort in his selling. This has brought good results.

Other problems still await action by the wholesalers in the realms of both economics and policy. These are issues between the jobbers and the manufacturers, the power companies and the contractors, as groups, that will have to be worked out on the basis of the broad interest of the industry and the public. It would seem that there could be no better time to approach these problems than now, and committee appointments already made indicate an eagerness to be about it. The world is clamoring for relief from the present high cost of distribution in all lines. The N.E.W.A. has a natural responsibility for leadership in so far as the electrical field is concerned, drawing fully upon all branches of the industry for such help as they may give. The future of the wholesalers in this and other markets will rest largely on how seriously they take this responsibility in the years immediately ahead.

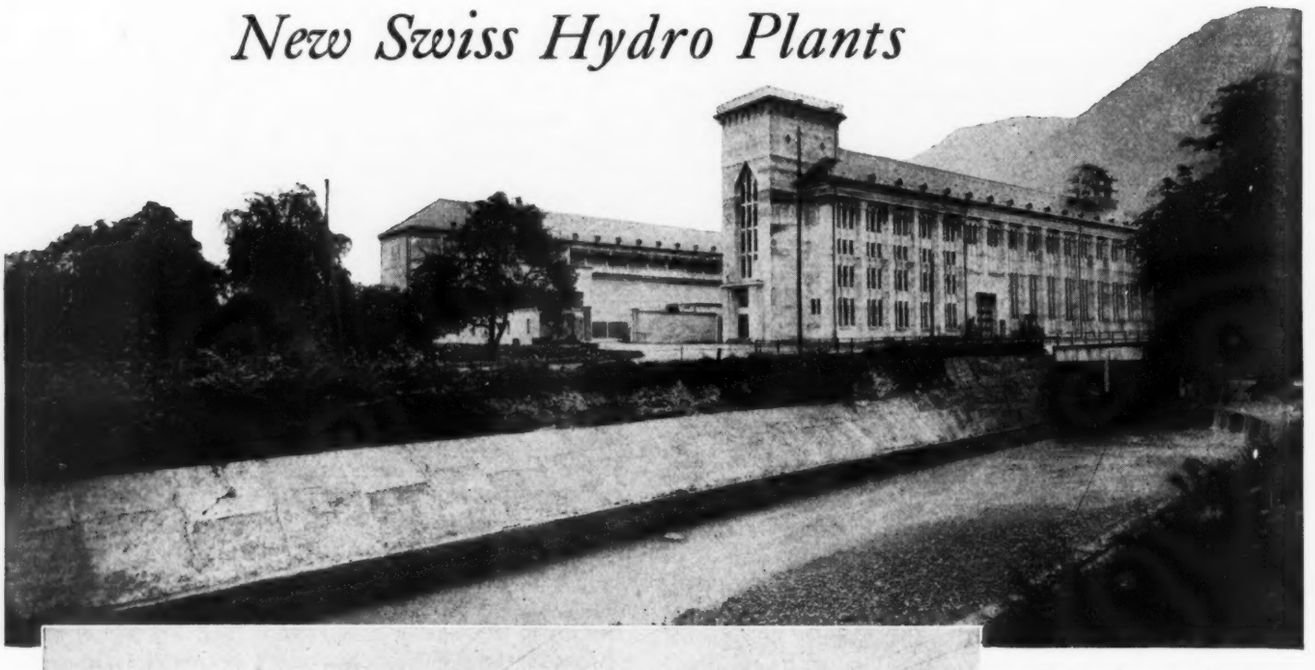
* * * *

An Opportunity for Lighting

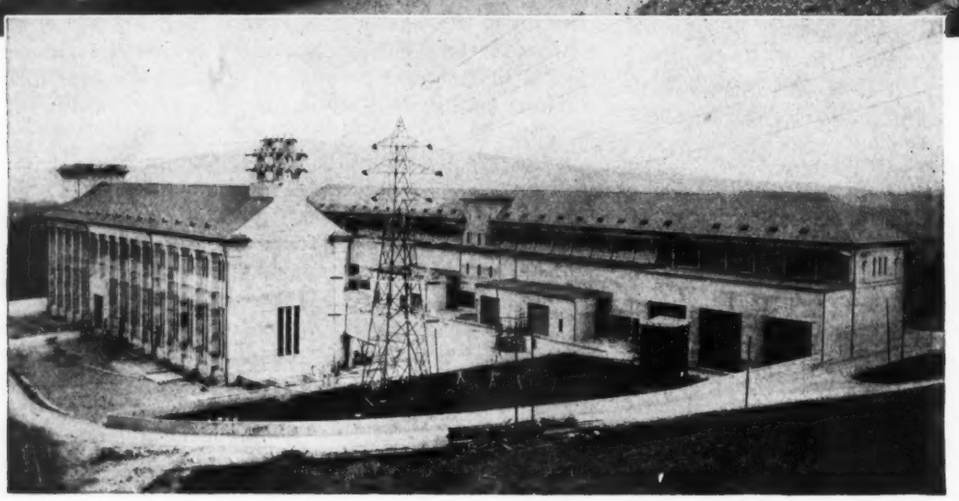
FACTORY lighting and ventilation should be supervised by the state through a licensing system. This is a recommendation of Dr. George M. Price, director of the joint board of sanitary control in the women's garment trades, and was called forth because of poor lighting and ventilation in the six thousand garment factories in New York. In 1913 a report showed that nearly 75 per cent of garment workers had defective eyesight, and, in the opinion of Dr. Price, the percentage is nearly as high at present. Not more than 5 per cent of these factories have sufficient daylight for the workers. These conditions are inexcusable, for lighting as an art has been developed so that any industry at very small cost can have abundant light of the right quality.

It would appear that the electrical industry has not educated the garment trades. State intervention in a common-sense situation where production alone makes good lighting economical is a remedy to be applied as a last resort.

New Swiss Hydro Plants

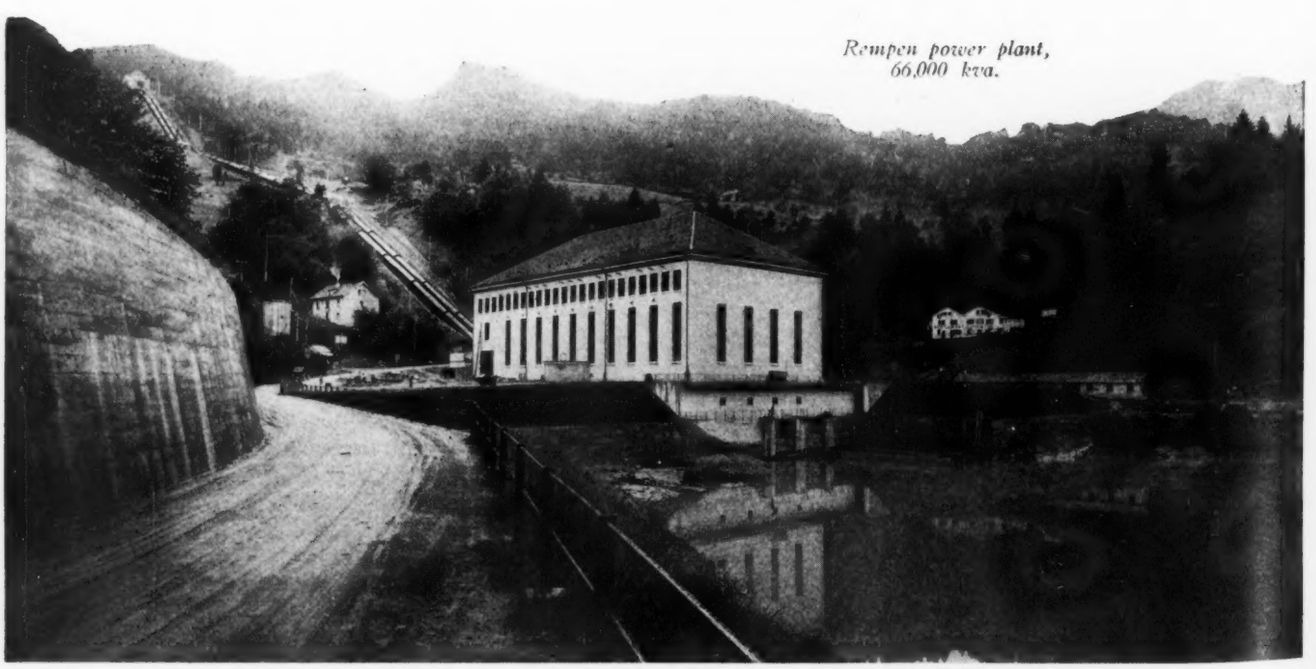


Power house and tail-race at Siebnen plant



Generator and switch buildings in Siebnen power plant, 66,000 kva.

Rempen power plant, 66,000 kva.



110,000-Kw. Unit Operating
at Hudson Avenue

Largest machine of its kind with flat water rate curve served by four boilers. Novel stokers and hydraulic sluicing air removal jets and extraction heating used. Details of installation and heat balance chart

By J. N. LANDIS

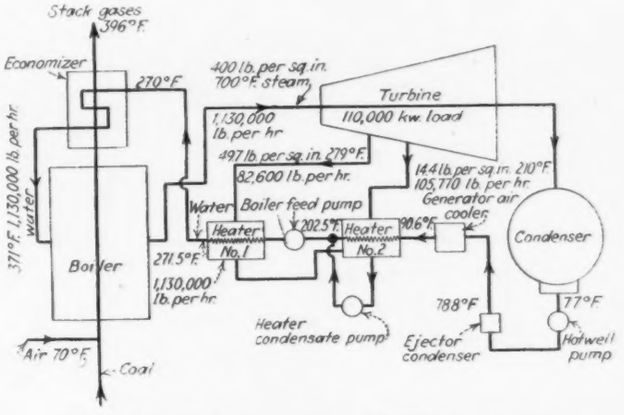
Plant Equipment Engineer Brooklyn Edison Company

THE Brooklyn Edison Company in its Hudson Avenue generating station has recently started operation of a 110,000-kw. turbo-generator set with its attendant equipment. This machine and the 85,000-sq.ft. single-pass condenser serving it again establish the record for the largest operating equipment of the type, just as was previously the case with the Nos. 1 and 2 50,000-kw. single-generator machines with their condensers and the No. 4 80,000-kw. turbine and its condenser.

The turbine is a Westinghouse cross-compound machine, designed for 400-lb. pressure, 700 deg. total temperature and two stages of feed heating. It is served by four Westinghouse underfeed stoker-fired B. & W. boilers of 23,830 sq.ft. heating surface, equipped with 14,960-sq.ft. return bend type B. & W. economizers. The stoker is distinctly novel in that a 33-tuyère conventional underfeed area feeds onto a short length of essentially chain grate area, arranged to reciprocate up and down in sections to produce a wave-like motion moving the coal to the clinker grinder pit; also in that in the front wall of the clinker grinder pit all cast iron has been eliminated by building the front pit wall of hard burned paving brick with a cooling water spray over it. The furnaces are surrounded by Bailey water walls on three sides and a carborundum front wall. The forced draft and induced draft fans will control air or gas pressure and volume through the use of movable guide vanes in the fan inlets.

When starting the engineering of the No. 5 installation the outstanding desire was to decrease station investment costs per unit of capacity, and it was recognized that this could best be done by the installation of large units. Operation of the No. 4 80,000-kw. unit had shown the possibility of carrying that load on three boilers for peak conditions. Four new boilers were to be added with the new installation and it was felt that at all times of peak load seven boilers of the eight for units Nos. 4 and 5 could reasonably be expected to be available. It was reasoned that three of these would carry the 80,000-kw. machine and the remaining four could supply steam to an approximate 100,000-kw. machine. It was decided to specify a machine of this capacity with a limiting allowable maximum load B.t.u. rate of 12,000, to correspond with extremely adverse summer conditions of 27.5-in. vacuum. One of the turbine manufacturers requested the privilege of bidding on a machine with a capacity in excess of 100,000 kw., but which would not consume more heat than that specified as maximum allowable for the 100,000-kw. machine. Accordingly a premium was offered for capacity obtainable above 100,000 kw. at the named heat consumption due to machine efficiency, with the final result that a Westinghouse cross-compound turbine was purchased capable of carrying 108,600 kw. when consuming 1,200,000,000 B.t.u. with 27.5-in. vacuum. The manufacturer decided to build and rate this machine for 110,000 kw. at 27.5-in. vacuum.

With the exceptions hereafter noted, the turbine is of the same general design and construction as the No. 4



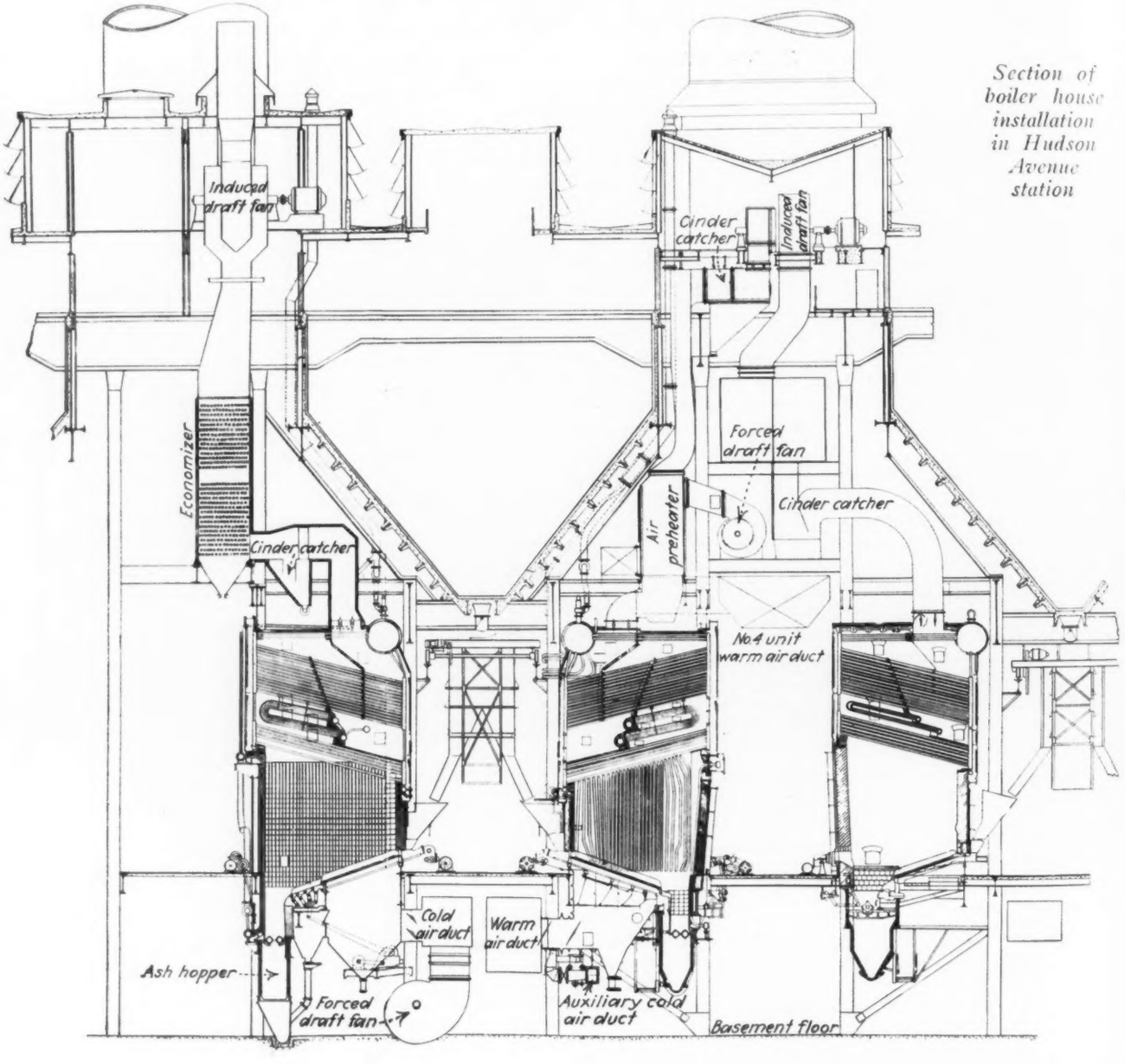
Heat balance diagram for 110,000-kw. unit in Hudson Avenue station

turbine, which has previously been completely described in the technical press.* The No. 5 unit is provided with five steam admission valves, in contrast to the No. 4 unit, which has but three. This is due to the great stress the Brooklyn Edison Company put on the value of a machine with a flat water rate curve. Stainless steel is used throughout the turbine for the rotating blades. The use of this material permitted the design of the blades for greater stress than would ordinarily be allowable, thus making possible the use of longer blades and higher tip speeds than heretofore. On this unit the oil pumps are single-stage centrifugal oil pumps mounted on the ends of the shafts, instead of being driven by gears from the shafts, as on No. 4. This is the first unit on the Brooklyn Edison system to be furnished with a turning gear for rotating the spindle at low speed when the turbine is

*"*Details of Hudson Avenue 80,000-Kilowatt Turbine Unit," "Power," Nov. 30, 1926, pages 815-818, and Jan. 11, 1927, pages 52-54.*

shut down, to prevent kinking of the spindle. This device is thrown in gear when the spindle is slowing down, continues to rotate the spindle during entire period of shutdown and is thrown out of gear when the machine is started up.

The condenser negotiation ended with the purchase of an 85,000-sq.ft. single-pass condenser, the largest of this type in operation. This constituted a change in company practice with reference to condenser engineering, two-pass designs previously having been specified. The conclusion should not be drawn that only single-pass condensers will be installed in the future. A limitation exists in the amount of water which can be handled through the circulating water tunnels due to the original station layout having contemplated an ultimate capacity of but 400,000 kw. For this reason a maximum water use of 135,000 g.p.m. was allotted to this installation. As something approaching this same water quantity limitation will be specified on future Hudson Avenue condensers, it is very possible that if turbines even larger than the No. 5 are installed there will be a reversion to the use of two-pass condensers. The condenser is of the Westinghouse radial flow type and contains 85,000 sq.ft. of condensing surface, consisting of 14,400 $\frac{7}{8}$-in. tubes 26 ft. long. The steam jet air removal equipment consists of three three-stage air removal jets, with the air removal piping so arranged that one of the banks of jets normally will be connected individually to each one of three longitudinal steam space compartments formed by two tube support sheets. In this manner each jet will produce the air removal suction required by its particular compartment as determined by the pressure drop through each. Water is supplied by two 67,500-g.p.m. pumps, each driven by a two-speed squirrel cage motor with switching provisions at the motors.

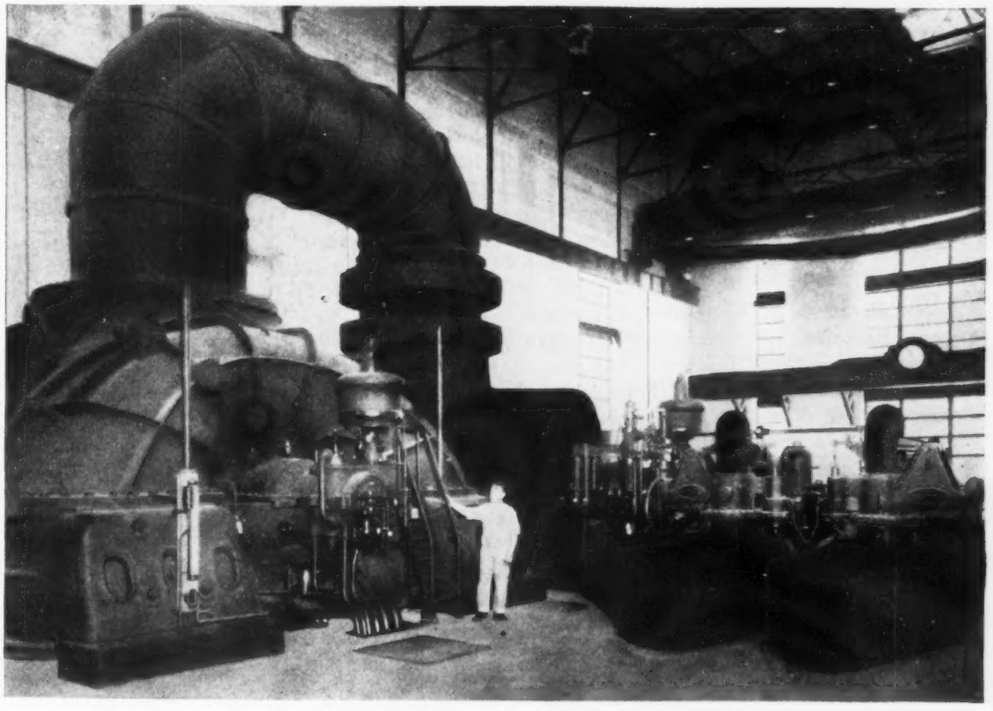


Section of boiler house installation in Hudson Avenue station

Feed heating is accomplished by means of two stages of extraction from the turbine. The path of condensate flow is shown in an accompanying diagram. Two stages of feed heating were selected because of the use of economizers in the boiler house; also to simplify the turbine room basement layout.

In consideration of the boiler house and turbine room

basement layout, a careful comparison was made of economizers and two-stage feed heating versus air preheaters and four-stage feed heating. Experience had been gained on the No. 4 unit with preheated air, and while no handicaps faced the repetition of the use of preheated air from the standpoint of using it in conjunction with stokers, there were very definite objections to its use on account of layout difficulties. The original building design of the Hudson Avenue station did not contemplate installation of air preheaters, therefore adequate space is not available around the boilers to bring down individual preheated air ducts. Consequently, it was found necessary on the No. 4 design to run a group duct the full length of the boiler house at the elevation of the top of the boilers, and again as a distributing duct below the boiler room operating floor. Such a layout makes undesirably congested conditions in the boiler house. This



Steam end of 110,000-kw. Hudson Avenue turbine

condition, together with difficulties attendant on dampering off shutdown fans and shutdown boilers from the group duct and general heat conditions due to extensive hot air duct areas, influenced heavily against a duplication of the preheated air layout. The carefully prepared investment and operating cost analysis showed a slight capitalized saving in favor of installing air preheaters, but it was judged that the unevaluatable handicaps against the necessary air preheater layout were sufficient to overbalance the preference for preheated air shown in the comparison of tangible items. As the design with economizers actually materialized, it resulted that somewhat greater boiler house capacity was secured than in the case of the preceding preheated air installation, and this with a much simplified layout.

In the handling of the boiler, economizer, water wall and stoker business effort was made to allow each bidder as much latitude as possible in making the most advantageous proposal. To this end the specification, rather than containing a specific extent of boiler and economizer surface desired, instead consisted of a very complete set of layout drawings showing the space in which the apparatus would be installed, together with a binding definition of the quality required and of the conditions under which the equipment would be expected to operate. The specification was otherwise largely concerned with a description to the manufacturers of how the proposals would be judged comparatively. Thus the manufacturers could, before proposing, determine from several different boiler, economizer and water wall combinations the best as measured by the evaluation process to which they would be finally subjected.

It was believed that considerable advantage would result from placing with one manufacturer the contract for the boiler, economizer, water wall and all steel work involed in conjunction with these. Bids were secured in such a way as to permit placing component parts of the business with different manufacturers if it should appear desirable, but finally the four major elements named above, together with the cinder eliminators, soot blowers, feed regulator valves, boiler casing, flue work between boiler and economizer and boiler drain and soot blower piping, were all placed with the Babcock & Wilcox Company, with the further understanding that it care for all the detail work of preparing construction drawings to co-ordinate the several parts of its own contract and in addition the separately purchased stoker.

New Type of Stoker

The stokers for the No. 5 unit are a distinctly new design in that they embody a conventional type of underfeed section 33 tuyères long discharging across an approximate 76 ft. width of rocking link grate just ahead of the ashpit. The link grate section is made up of frame castings, into which are inserted links quite similar to those used in chain grate stokers. By a system of supporting arms carried on fixed pivots, together with others carried on rocker arms, this link grate section is caused to reciprocate up and down with a wave-like

motion, breaking the coke and feeding it down to the ash pit. The entire projected stoker area, including the pit, is 524 sq.ft. Windbox subdivisions were not used, excepting that the air pressure to the link grate section can be dampered down. The stoker is provided with one driving motor for the underfeed section proper, two driving motors for the clinker grinder and a fourth motor for the rocking grate section. The rocking grate section was arranged to be driven independently in the interest of segregating the drive from the stoker proper because of uncertainty as to the exact requirements of motion in relation to the rest of the stoker. The stoker motor and the clinker grinder motors are controlled in the conventional manner and the link grate motor is controlled by a resistor, the controllers of which are mechanically interlocked with the controllers of the main stoker motor resistor, so that the speed of the two bear at all times a definite relation of one to the other. In addition to speed control of the rocking grate drive motor, further control is possible through a two-speed gear box. A stroke adjustment is provided for amplitude or lift control. Future designs conceivably may be simplified in respect to drive as experience is gained in operation. The stoker installation is also novel in that the front wall of the clinker grinder pit is constructed of hard burned paving brick, over which a small supply of water drains continuously to keep the brick cool, thus eliminating a section of stoker which has previously given rise to considerable maintenance expense.

Hydraulic Sluicing of Ash

A departure was made from the system of continuous hydraulic sluicing used on the first four rows of boilers, the intermittent type being installed instead. The No. 5 unit utilizes for its ash handling the Allen-Sherman-Hoff "Hydrojet" system. In the Nos. 1, 2, 3 and 4 designs the ash sluice was open between boilers, and it was found that when operating with the high fuel burning rates of the No. 4 row boilers air admitted to the clinker grinder pit to burn out the combustible in refuse would short-circuit through the rolls instead of passing to the furnace. At high ratings the rolls were in danger of burning and extreme care had to be exercised in their operation. The condition was aggravated by the fact that the "popcorn" blown over into the ash pit from the fuel bed tended further to seal the air away from the furnace. With no air passing through it, this blown coke failed to burn and accumulated to depths sufficient to impede the flow of fuel on the stoker. These conditions have now been eliminated by sectionalizing the sluiceway between boilers and sealing it to such an extent that full windbox pressure can be carried under the clinker grinder rolls. However, at the time of purchasing the stokers this solution had not yet been effected. Because the stoker manufacturer made an appreciably better guarantee of maximum fuel burning rate and combustion efficiency on the condition of the ash-handling system being capable of carrying a positive pressure, it was decided to install the Allen-Sherman-Hoff system, which embodies sealed ash storage except when sluicing and permits carrying a pressure under the rolls. In order definitely to centralize the responsibility for the two elements working together the ash-handling equipment was made a sub-contract of the stoker contract.

The furnace is of the Bailey water wall type on the two side walls and bridge wall. The front wall for three boilers is built of carborundum brick, which has been found to give perfect service, and for one boiler it consists of Babcock & Wilcox Company No. 80 brick, for trial. Exceptional effort was made to secure a tight furnace and boiler setting. Johns-Manville type water wall casing is used.

The boiler contains 23,830 sq.ft. of heating surface in conjunction with a three-pass superheater. The space equivalent to that for one tube is omitted between the bottom first and second rows of tubes, and to provide access to this space for lancing slag small access doors are provided in the front and rear boiler headers. Further provisions for lancing the lower boiler tubes are had from lancing doors installed under the upper header of the bridge wall water wall.

A Green "cinder trap" is installed between the boiler and economizer. Cinder removal from the cinder trap hoppers is by means of a suction system discharging by means of a steam jet evactor.

The economizer is of the Babcock & Wilcox return bend type, consisting of 14,960 sq.ft. of heating surface arranged 50 rows high, 26 tubes wide, of 2-in. tubes, 22 ft. long. The upper half of the economizer, as shown in the boiler house cross-section, is arranged for counterflow of gas and water and the bottom half is arranged for parallel flow. The discharge water from the upper half is brought into the bottom of the lower half and flows upward. This arrangement was selected by the maker to minimize the likelihood at low rating of steam forming in the economizer and working its way to the top, causing water hammer. A very careful check of the sacrifice in efficiency due to half of the surface being parallel flow instead of counterflow showed a decrease of $\frac{1}{20}$ per cent—entirely negligible.

Fan Installation

The forced and induced draft fans used constitute quite a departure from conventional design. Both are of the B. F. Sturtevant Company "vane-controlled" type. Control of air pressure and volume is secured by movable guide vanes or shutters in the inlets to the fans. By placing these vanes at different angles various degrees of "spin" are given to the air or gas entering the fan, with the result that with the fan wheel traveling at constant speed the wheel velocity relative to the air is decreased the greater the "spin" of the air admitted to the wheel. In this manner the air volume and pressure are controlled gradually, in contrast to the discontinuous variation secured with resistor control in steps. A decided virtue of the method of control in contrast to dampering on the outlet is less consumption of power. The accompanying curve shows for the forced draft fan the comparative horsepower consumption with outlet dampering and inlet vane dampering, when serving a certain representative pressure-volume curve as met with in practice. The curve is drawn for the forced draft fan as operated by a single-speed squirrel-cage motor. Were a two-speed drive used the saving in horsepower would be even more accentuated.

The automatic combustion control was arranged to work directly through hydraulic cylinders to the operating arms of the forced and induced draft fan vanes. In the case of the forced draft, because the fans supply into a common duct from which the several boilers draw their air supply, additional regulation had to be provided between the fans and the stoker windboxes to care for the individual variations in fire conditions. For this purpose individual boiler inlet dampers are provided, operated from the combustion control system. The control operates to hold a duct pressure slightly in excess of the requirement of the boilers, and the individual dampers reduce the pressure to the particular windbox

requirements. In the case of induced draft, the entire regulation is effected by operation of the induced draft fan vanes, the vanes of the two fans per boiler being mechanically interlocked. Single-speed squirrel-cage motors were installed on the forced draft fans, but on the induced draft fans, because of the very high ratio of maximum load to average load, two-speed squirrel-cage motors were installed to secure running economy. All switches are installed adjacent to the motors and are operated by the fan attendants.

In other details the design has followed closely along the lines established in earlier installations in the station. These have been described in several past technical articles and will be omitted here.

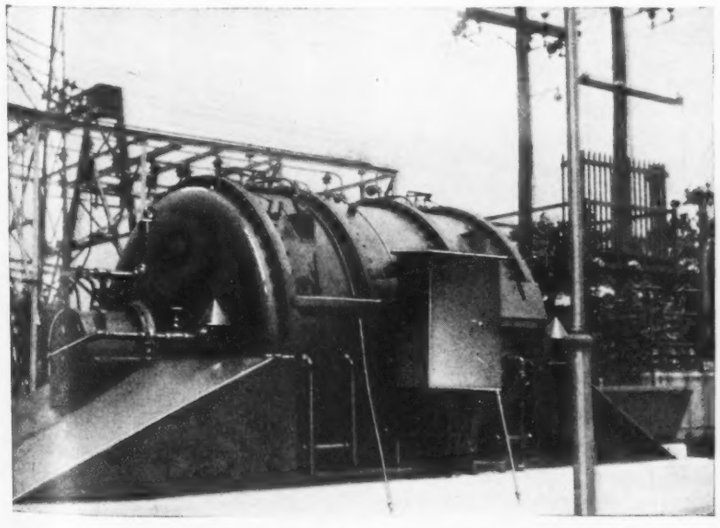
Outdoor Nitrogen-Cooled Rotary Condenser

AT THE Pawtucket switching and substation of the New England Power Company system a 10,000-kva., General Electric rotary condenser has recently been installed for power-factor correction, with the novel design feature of being inclosed in nitrogen gas to reduce friction losses and permit a 2,500-kva. increase in rating (total 12,500 kva.) when thus operating. It is a three-phase, 8-pole unit, designed to operate at 13,800 volts and 900 r.p.m. Direct-current excitation at 125 volts is provided by a 90-kw. motor-driven exciter.

The collector ring housing, which is the small projection on the end of the machine, is sealed from the main condenser housing by a packing gland, but nitrogen is permitted to flow into the housing through two small entrance pipes. A sheet metal hood extends over the entire pit and is provided with ventilators. On the center of the machine is a cabinet which houses the control valves for the nitrogen and a few instruments. On the top of the machine at the two outside ends are water-cooler headers. These are vented, the valves being controlled by handles at the side of the machine.

In the instrument and valve cabinet are housed bearing and nitrogen temperature thermometers, nitrogen pressure gages and nitrogen-pressure control relays and nitrogen-control valves.

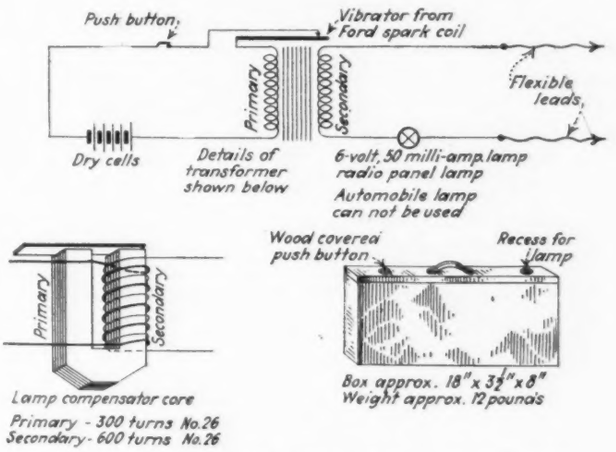
The condenser pit contains the nitrogen storage cylinders, the oil starting pump, the water cooler connections and the nitrogen purity recorder analyzer. A 4-in. vent is connected under the center of the machine to scavenge the machine from air or nitrogen as the case may be.



Rotary condenser installed to withstand rigors of weather

Portable Set Speeds Testing of Street-Lighting Transformers

FIELD tests to determine the condition of subway or aërial current transformers for series street-lighting service are carried out with a portable test set on the system of the Public Service Electric & Gas Company. This set, which was constructed by the utility,



Test set for street lighting maintenance possesses simplicity and portability

consists of four dry cells with interrupter, transformer and indicating lamp and has an output of approximately 6 volts on short circuit and 100 volts on open circuit.

The use of this device makes it possible to fix accurately the responsibility for a lamp outage by tests at the lamp socket. Inasmuch as the supply leads to the series transformer may be left intact, a considerable saving has been effected in the replacement costs of transformers which had heretofore been removed to the storeroom test source "on suspicion." The indicating lamp gives a dim light when applied to the secondary of a series transformer in normal condition and a bright light when the transformer or its secondary leads are short-circuited.

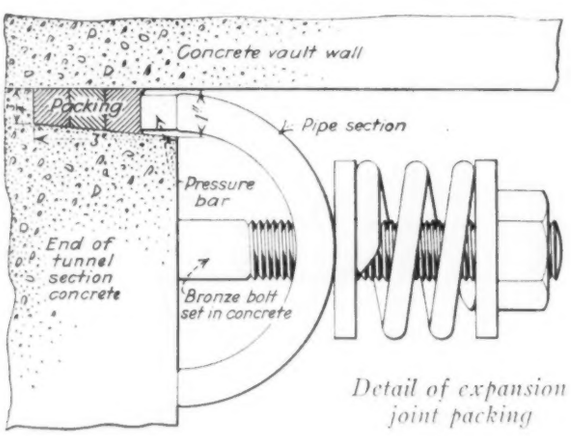
The set has also proved of value in reducing outage duration on underground distribution circuits which have been taken out of service for repairs, reconnection or for connection of additional transformers, by facilitating identification of phases. When a four-conductor cable is opened at a point remote from the substation the substation operator successively grounds phases at the substation, the portable set identifying the grounded phase by a full light. A dim light is obtained on the phases left ungrounded if distribution transformers are present between the test point and the substation, the transformer impedances acting as a choke in the test circuit.

Provision for Expansion in Underground Tunnel

By W. J. Millington
Byllesby Engineering & Management Corporation, Pittsburgh Branch

IN CONCRETE tunnels for electric or steam lines or both, in which the temperature range is sufficient to expand and contract the tunnel walls appreciably, some arrangement must be made to permit that expansion and contraction. Use is usually made of expansion joints in the tunnel itself, but the problem can be solved in another way, as was done in the steam line tunnels of the Allegheny County Steam Heating Company in the Golden Triangle district of Pittsburgh.

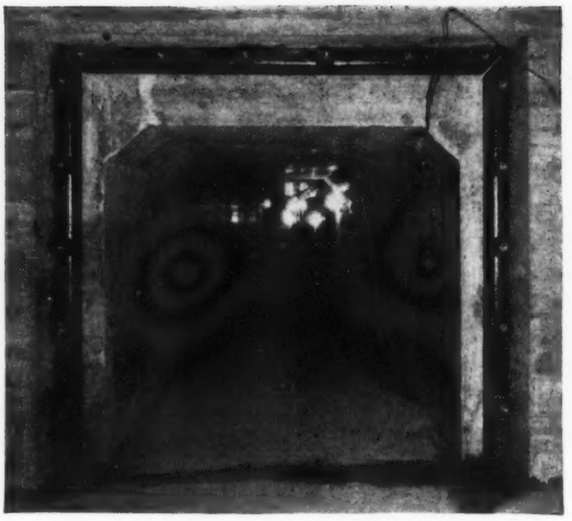
The half mile of tunnel, built during 1928, includes eleven vaults which were built first, each with a manhole opening to the street above. An opening was left in each end of each vault, large enough for the entire tunnel section to extend more than half way through the vault wall, thereby leaving room for expansion into the vault. The concrete in the tunnel is subject to a variation in temperature of approximately 100 deg. F. Continuous steel reinforcing of ¾-in. diameter high-tensile strength bars (minimum yield point 70,000 lb., maximum allowable stress 50,000 lb.) was used in the concrete. All laps were at least 12 in. long and were staggered. Sixty feet of tunnel section was poured at a time by the use of steel side and roof forms and a Ransome blower. All construction joints were made with a deep keyway, grout being used after making a construction joint.



Detail of expansion joint packing

Before each tunnel section was brought into a vault a copper pan was imbedded in the sill of the vault openings as a bearing plate for a similar copper pan in the under side of the tunnel section. Between these pans a mixture of graphite and cylinder oil was used to make a good sliding surface. The three other sides of the opening in the vault were coated with a concrete primer and asphalt cement to prevent any bonding of the concrete of the tunnel with the concrete of the vault.

The side and top outside edges of the end of the tunnel section were given a 3-in. back-step which tapered from ¾ in. deep at the back to 1 in. at the end of the section. Also 1-in. diameter bronze anchor bolts, spaced about 18 in. apart, were imbedded in the end of each section. The back-step was packed with two strands of ¾-in. J-M twisted "Mogul" packing, one strand of ¾-in. J-M braided "Mogul" packing and one strip of ¾-in. square Corey "Elastite." This packing was held in place by half sections of 5-in. pipe pressing against ¾-in. square steel bars laid against the packing. A continuous pressure was exerted upon the packing by the edges of the pipe halves which were held by coil springs on the bronze bolts.



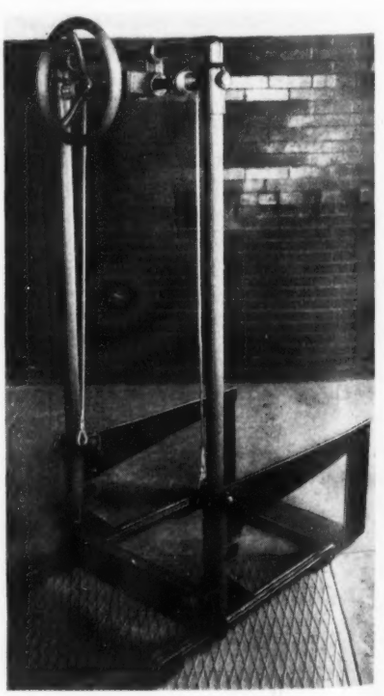
Tunnel expansion joint in manhole vault

As the concrete expands the packed joint allows the whole tunnel section to move into the vault without leakage. A space of about 8 in. was left for expansion. Steel floor plates cover the expansion joint.

Tank Lifter Simplifies Maintenance of Oil Circuit Breakers

MAINTENANCE and inspection of indoor type oil circuit breakers is simplified on the system of the Public Service Electric & Gas Company by means of a tank lifter which was built by the substation maintenance department of that New Jersey utility. This device has proved its worth in the course of several months' use in the substations of that company.

The platform is raised or lowered by a handwheel operating a grooved wire rope reel through bevel gears. Sufficient lateral motion is permitted by the rollers bearing on the vertical framework to allow the breaker tank to be returned to the breaker without manual lifting. The unobstructed space between vertical supports renders the tank bolts readily accessible.



Tank lifter offers quick handling of oil circuit breakers

Steam Predominates in France

STATISTICS recently completed by the French Ministry of Public Works show the development of electrification in France to have attained the following figures for the calendar year 1926:

	Thermic	Hydraulic	Total
Power installed, kva.	4,624,000	1,719,000	6,343,000
Normal power available, kw.	2,941,000	772,000	3,731,000
Energy produced, kw.-hr.	6,568,000,000	4,778,000,000	11,347,000,000
Utilization, hours	1,420	2,780	4,200

The table embraces all stations linked with lines of distribution or transport, but excludes thermic centrals belonging to industrial corporations and non-communicating with distributing systems. "Power installed" includes reserves. Under "Normal power available" is inscribed the maximum producible by thermic stations and the annual average for hydraulic.

To the total given above for energy available must be added 400,000,000 kw.-hr. imported and deducted 44,000,000 kw.-hr. exported in order to find the figures for actual consumption—11,703,000,000 kw.-hr. It is calculated that 14 per cent of this energy is lost en route or in transformation, 16 per cent is consumed at low tension (9 per cent for lighting and 7 per cent for motive power), 46 per cent at high tension for other purposes than electrochemical and electrometallurgical and 6 per cent for electric traction. The length of the transmission lines in France is as follows:

	Kilometers
Below 600 volts continuous or 250 volts alternating	73,336
Below 60,000 volts continuous or 33,000 alternating	89,276
Above 60,000	7,790
Total	170,402

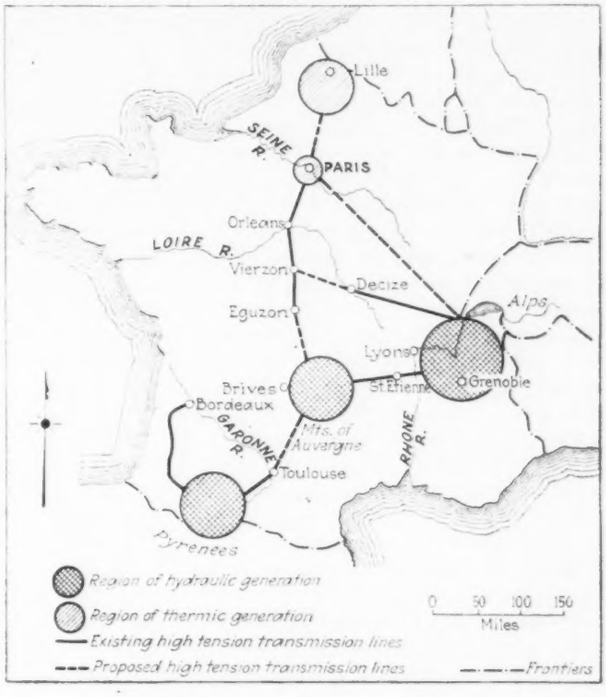
Consumption per head of total population works out at 287 kw.-hr. upon the basis of energy delivered plus that consumed at point of origin. Low tension use per head of the population served by electricity is 34.5 kw.-hr. for lighting, 27.8 kw.-hr. for power, and 62.3 kw.-hr. total.

If one looks back over the progress made in recent years it will be found that between 1923 and 1926 the energy produced by thermic plants increased from 4,084,000,000 kw.-hr. to 6,568,000,000 kw.-hr., while that of hydraulic stations rose only from 3,405,000,000 kw.-hr. to 4,778,000,000 kw.-hr. The cause can be found in the financial troubles of the republic. Since the recent stabilization of the franc, however, there has been a return of attention to water-power installation, for stock issues have thus been rendered possible, although bond issues are still prohibitive, due to the high cost of money on long term.

There are two great regions of France where hydraulic power predominates. The first is the southeast, comprising the Rhone, Isère, Durance and other valleys. About half the normal available power in the country is derived from this locality, and yet only some 25 per cent of the usable power of the Alps has been developed.

The southwest is also a region of water power, embracing the Pyrenees. Here the absence of coal, in the western portion at least, has given an attractive stimulus to water-power installation, with the Midi Railway to the fore, contrasting with the Paris-Lyons-Marseilles, which has done little in the way of electrification. The harnessed power of the Pyrenees already attains a third of the potentially usable, though there is only one large city, Bordeaux, to be fed. Thus, there is much territory in southwestern France awaiting development through electricity.

Thanks to the excellent plan for co-ordinating the various sources of power and rationalizing distribution, the future electrical map of France is clear. The north-



Major French power zones

south high-tension circuit will run from Lille to Paris, thence through Orleans to the Massif Central and thereafter through Toulouse to the Pyrenees. East of it will be additional high-tension lines connecting the Massif Central with the Alps and the Alps with Paris. A westward extension already connects the Pyrenees with Bordeaux. From these main arteries, which have only the northwest unprovided for, will run numerous branches of medium voltage feeding in turn innumerable low-tension lines which will carry the current to nearly every hamlet in France.

Synchronous Condenser Installed for $10 per Kilovolt-Ampere

(Massachusetts Company, 1927)

One 7,500-kva., 900/4,000-volt synchronous condenser with 42-kw. exciter and 7,500-kva., three-phase transformer, 22.8 kv. delta on primary.

Major items of above installation:	
Synchronous condenser	$17,750.00
Transformer for condenser	15,145.00
One two-section surface air cooler	2,362.00
Switchboard	7,605.00
Three relays	100.00
One 12-in. recording thermometer 10-77 deg. C.	151.35
Transformer track, condenser	6,791.25
63 bus supports	623.70
Labor	11,282.96
Engineering	5,665.20
Miscellaneous supplies and expenses	7,788.82
Total cost of job	$75,265.28

Ultra-Violet Radiation from Tungsten Filament Lamps

By M. Luckiesh
Director Research Laboratory, National Lamp Works, Cleveland

Interest in ultra-violet therapy at present centers around the spectral region approximately between the wave-length limits from λ3,200 to λ2,800. Ultra-violet radiations of other wave lengths produce many effects and, therefore, have many applications. However, for such purposes as the prevention and cure of rickets, radiations of shorter wave lengths than λ3,200 are the most effective. There is some indication that radiations of shorter wave length than perhaps λ2,800 may be harmful, at least in overdoses. In the absence of knowledge it seems prudent to avoid radiations of shorter wave lengths than λ2,800, inasmuch as these do not reach the earth from the sun and, therefore, human beings may not be adapted to use them beneficially.

The filaments of present tungsten lamps emit relatively very little energy shorter than λ2,800. Furthermore, ordinary glass bulbs do not efficiently transmit radiant energy shorter than λ3,200. For this reason it is of interest to learn whether or not it appears worth while to equip present filament lamps with special bulbs. Finally, physicians, physiologists and others must determine whether or not tungsten lamps have a field of usefulness in ultra-violet therapy, but these researches will be tedious and time-consuming.

We have made computations of interest in this field of widening interest. From data and experience we are assuming as a basis of comparison that 2 per cent of the total solar radiation reaching the earth's surface on a clear day in summer, between 9 a.m. and 3 p.m., is of wave lengths between λ3,200 and λ2,800. Probably this is more nearly a maximum than an average value, but will serve, nevertheless.

On the basis of equal total energy, the percentages of the energy between λ3,200 and λ2,800 are approximately as given in one column below for several sources of radiant energy. As a matter of interest, the amounts of radiation between these wave lengths are also given in the last column relative to that in solar radiation.

	Percentages	Relative
500-watt tungsten lamp designed for 1,000-hour life	0.0176	0.009
500-watt tungsten lamp designed for 100-hour life	0.0471	0.024
900-watt tungsten movie lamp designed for 100-hour life	0.0538	0.027
Solar radiation at noon on a clear summer day	2.00	1.000
450-watt Cooper-Hewitt quartz mercury arc	3.15	1.575

Assuming that 2 per cent of the total solar radiation reaching the earth on a clear day in summer is of wave lengths between λ3,200 and λ2,800, which are known to produce beneficial therapeutic results, and considering the radiation from the filaments of the tungsten lamps, before it reaches the bulb, the relative amounts of this energy per lumen are found to be approximately as follows:

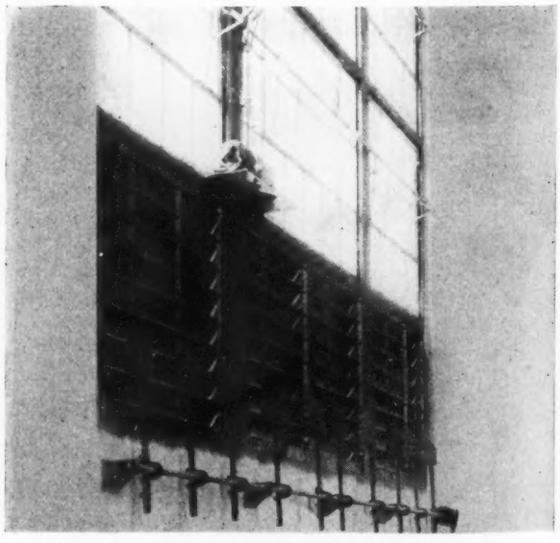
500-watt tungsten lamp designed for 1,000-hour life	0.05
500-watt tungsten lamp designed for 100-hour life	0.09
900-watt tungsten movie lamp designed for 100-hour life	0.10
Solar radiation at noon on a clear summer day	1.00
450-watt Cooper-Hewitt quartz mercury arc	3.10

Daylight intensities on clear days outdoors are measured in thousands of foot-candles, the maximum being in the neighborhood of 9,000 foot-candles. If the physiological effect of these ultra-violet radiations is directly proportional to the product of the duration of exposure and the intensity, which is not necessarily true, 100,000 foot-candles from the ordinary 500-watt tungsten lamp, equipped with a bulb which transmits the radiations under consideration, would be required to equal the effect of 5,000 foot-candles of solar radiation in the same period of time. Such an intensity of illumination from tungsten lamps is quite out of the bounds of practicability.

However, we need not give up at this point, because we may greatly increase the duration of exposure to the radiation from the filaments of tungsten lamps. Suppose tungsten lamps were equipped with special bulbs and the lighting equipment were made of suitable diffusing and reflecting materials. What results could be expected if users of light were showered for hours by even the small amounts of the known beneficial radiations from tungsten filaments? If the beneficial results depend directly upon exposure times intensity, approximately the same result would be expected if a human being were exposed 5,000 minutes to 20 foot-candles from the 500-watt tungsten lamp, with a special bulb, as if he were exposed to 5,000 foot-candles of noon sunlight for one minute.

It appears that ultra-violet energy is efficacious even when only the hands and face are exposed. Possibly the relatively small amount of ultra-violet energy emitted by tungsten filaments is much more effective per unit of energy than the larger amount in solar radiation. This and many other questions remain to be answered by researches before the final answer can be given.

Motor-Driven Mechanism Operates Large Windows



At the Long Beach steam plant of the Southern California Edison Company the windows are of such size that some means for opening and closing them other than by manual effort was desirable. The illustration above shows a motor-driven-operating mechanism which permits window movements from a remote-control station without effort or lost time on the part of the attendant. A limit switch prevents overtravel in either direction.

Steel vs. Concrete

Turbo-Generator Foundations

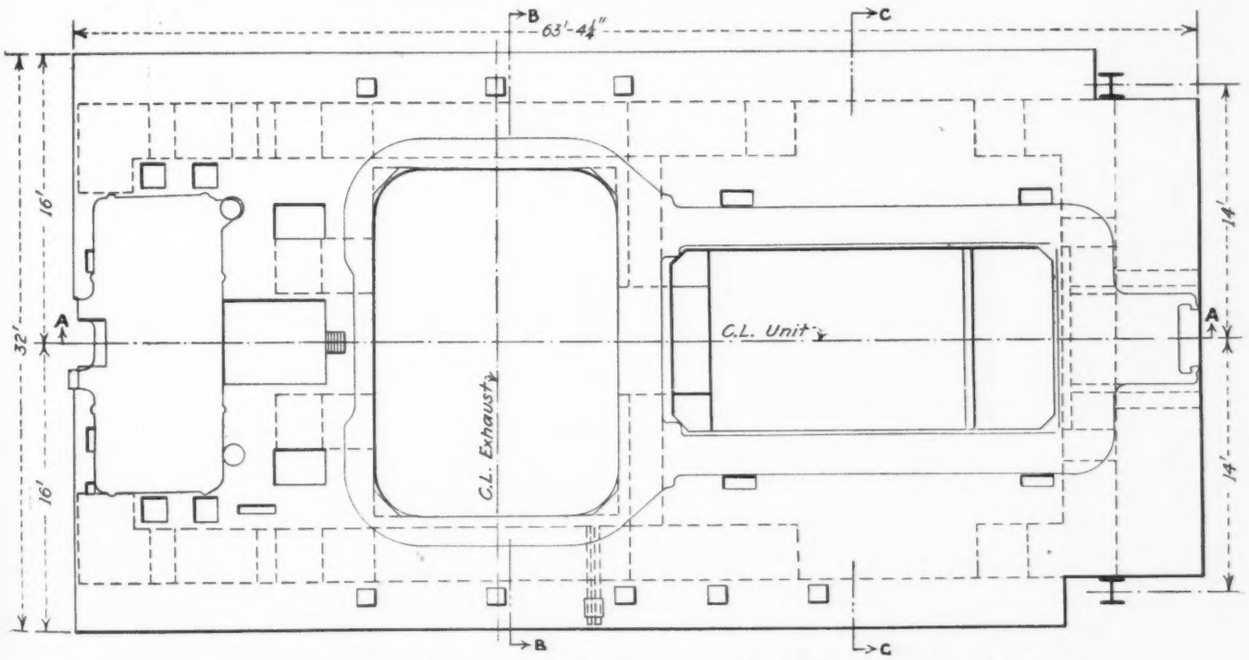
Vibration, maintenance and reliability are factors that determine desirability according to Detroit company which uses both types. Comparative costs are given

By J. R. JAMES

Engineering Division, Detroit Edison Company, Detroit, Mich.

AT THE present time the Detroit Edison Company is actively engaged in the construction of a third power house at the Delray plant to be known as Delray power house No. 3. The foundations, consisting of concrete caissons to rock, were commenced in the spring of last year and the cornerstone of the turbine house was laid the forepart of this summer. It is expected that two units, each of 50,000 kw. capacity, will be ready for operation in the summer of 1929.

One of the early problems, on which considerable thought was spent, called for a decision as regards the nature of material to be used for the turbine base, as in the past this company has at times used concrete, although the majority of the supports of present machines are of steel. Identical units at the Trenton Channel plant are supported on steel structures capped with a 5-ft. slab of concrete and in the main are satisfactory, but they have their peculiarities. The Trenton machines, when first installed, had some vibration troubles, which were more apparent when starting up the unit than when running under steady load. After further balancing by the manufacturer and after a proper starting cycle had been established these units have operated satisfactorily. The main source of the vibration, when bringing these units up to speed, is due to the bowing of the shaft. The extent of this bowing is dependent on how many hours the unit has been shut down and is maximum for a certain critical shut-down period. In the Trenton units this period is about fifteen hours. This situation is brought about largely, it is thought, by the stratification after shutdown of the atmosphere within the casing, the hottest layers being at the top and causing an expansion to a greater degree than by the cooler layers at the bottom. The resultant of these unequal expansive forces produces a bowing of the shaft.



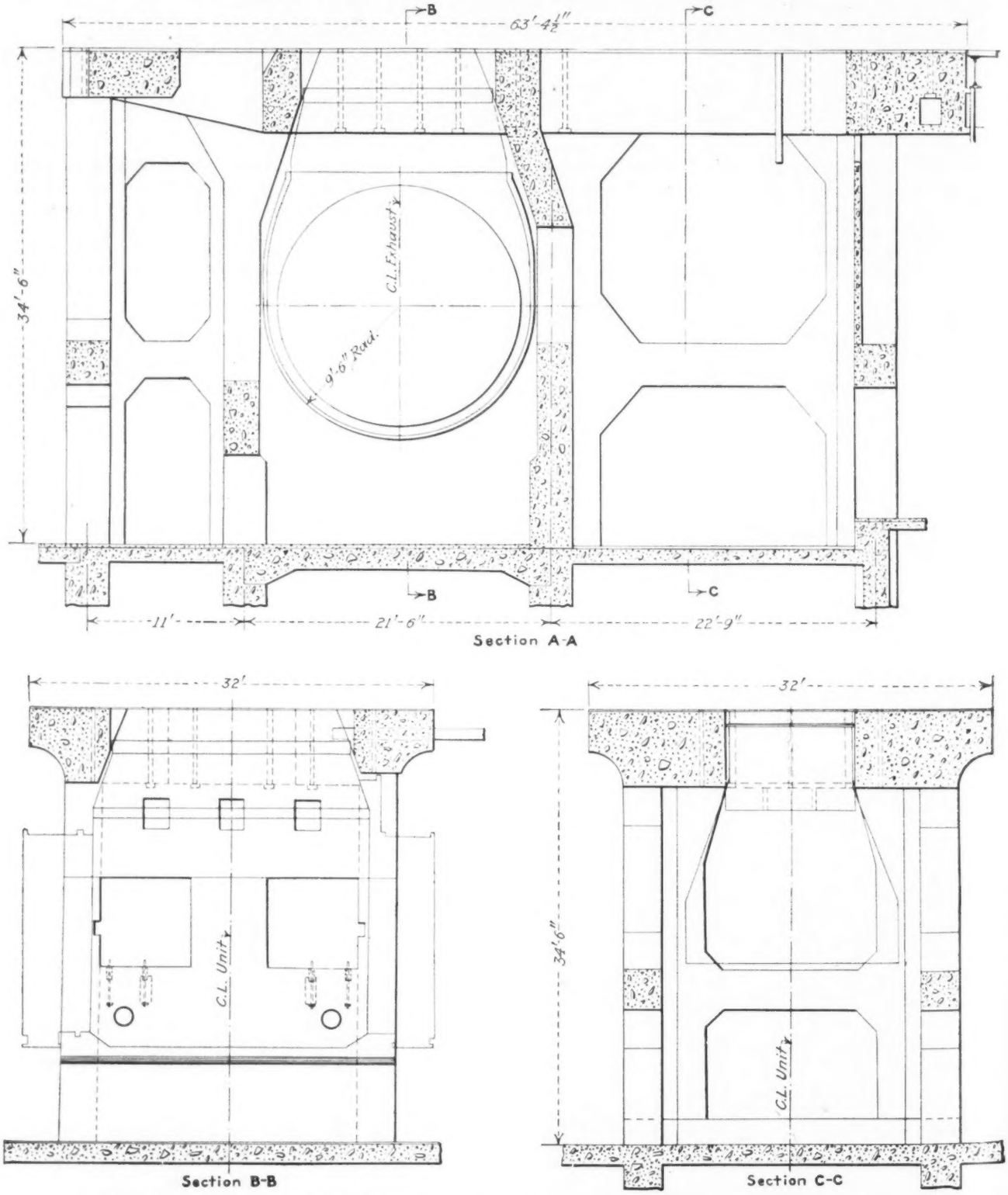
Plan of concrete turbine bases in Delray power house No. 3, Detroit Edison Company

To overcome this condition a starting cycle, the principal function of which is to allow enough time for the shaft to straighten out, was set up. The Trenton Channel machines require about two hours for this starting cycle. From an operator's standpoint this is not a very desirable situation, as oftentimes a unit is needed immediately and at best it is not always possible to anticipate a change of load two hours in advance, consequently it is

frequently necessary to start a turbine rolling with a better margin of time than two hours, merely to play safe.

A steel base is almost sure to be resonant to some of the many periodic disturbances in a turbine and there seems to be but two remedies—one is to balance the turbine more exactly in the field and the other is to change the mass and stiffness of the supporting structure. This last method was very well verified in some of the Trenton steel bases. Purposely all columns were designed with box sections. Filling these with concrete had a noticeable effect on the turbine behavior, showing that the concrete had a considerable dampening effect.

With previous experiences in mind, therefore, and as the new Delray foundations rested on rock, it was decided to construct concrete bases. On the other hand, had the building foundations been of the floating type, namely, a heavy concrete mat supported directly on the clay with no piling, there is no doubt whatever but that



Typical sections of concrete turbine bases in Delray power house No. 3, Detroit Edison Company

a steel base would have been the one used in order to reduce the dead weight, which is no mean item. The heaviest steel base so far built for any of these 50,000-kw. units weighs about 600 tons, whereas a concrete base weighs approximately 1,100 tons. Furthermore, power-house foundations on clay, in this area, are expected to settle to some extent. With a steel base it is possible to maintain the machine in a level position, when provided for in the design, by the use of shims which can be removed or inserted, depending on the situation at hand.

The question might be asked whether or not a foundation could be constructed too rigidly. To take an extreme example, imagine a unit bolted to solid rock. It is reasonable to surmise that, when a distorted shaft is revolving within rigidly placed bearings and casing, more or less rubbing would take place, whereas on a less rigid structure the unit as a whole would move together and in that way tend to eliminate contact within the casing. In contrast to this example, attention might be called to a spring foundation under a 2,000-kw., 3,600-r.p.m. turbine, direct connected to a 2,500-kva. generator at the Marysville plant of this company. This unit is bolted to a combination steel and concrete slab 32 ft. long x 12 ft. 9 in. wide and 22 in. thick. This pad, in turn, is supported by eight clusters of springs, there being six springs in each cluster. These nests of springs are located on each side of the long axis of the pad and approximately at the quarter points. It is almost impossible to balance such a unit 100 per cent. Therefore, when it is rigidly mounted its small unbalances frequently set up vibrations in resonant members of the floor system that are very annoying and harmful to efficient operation. The springs, however, prevent the transmittal of vibrations to the building structure. The Marysville units, with this very flexible type of foundation, operate satisfactorily and do not transmit any perceptible vibrations to the floor system.

Comparison Between Eight and Twelve Steel Base and an Entire Concrete Base

	Eight-Column Steel Base Trenton		Twelve-Column Steel Base Trenton		Concrete Bases Delray No. 3	
Steel work—						
Framing	$7,625 (*140 tons*)		$12,300 (*265 tons*)			
Labor to fabricate	4,870		11,700			
Labor to erect	2,650		7,250			
		15,145		31,250		
Form work—						
Material	150		550		$1,700	
Labor	3,200		3,780		10,200	
		3,350		4,330		11,900
Reinforcing steel—						
Material	400 (*11,250 lb.*)		705 (*34,100 lb.*)		1,800 (*53,000 lb.*)	
Labor	175		560		1,000	
		575		1,265		2,800
Concrete—						
Material	1,435 (*230 yd.*)		1,940 (*307 yd.*)		3,500	
Labor	575		775		2,100	
		2,010		2,695		5,600
Miscellaneous—						
Material	1,060		2,330		3,000	
Labor	540		1,260		1,700	
		1,600		3,590		4,700
Total		$22,680		$43,130		$25,000

So far as accessibility is concerned for piping and equipment, using for comparison the Trenton installation, which is quite similar to Delray power house No. 3, the light steel bases composed of eight columns are much better than the concrete design. On the other hand, with the heavy steel base composed of twelve columns, the concrete base has the advantage.

As to stresses used, the compressive stress in the columns of the concrete support has been kept very low, about 200 lb. per square inch maximum at contact with basement floor. The plan and sections here shown give a good idea of the dimensions used. The foundation was liberally supplied with inserts for supporting piping, and small equipment. These bases, when dry enough, are painted.

As regards cost, the accompanying table gives a comparison between an eight- and a twelve-column steel base and an entire concrete base. All these supports are for a General Electric 50,000-kw., 1,200-r.p.m. machine.

It is quite apparent, for 50,000-kw. units at least, that so far as rigidity is concerned, it can be purchased more cheaply in a concrete base than in a steel base.

In the eight-column steel design the maximum deflection of any one column is 0.0765 in., the stress varying from 4,000 to 7,700 lb. per square inch. In the twelve-column design the maximum deflection was 0.0341 in., the stress varying from 2,000 to 3,500 lb. per square inch. The deflections in the deck and bracing of steel structures, although small, are of course larger in concrete structures, where they are almost negligible.

Two concrete bases were poured at Delray power house No. 3 in August. Each foundation contains 550 cu.yd. of concrete. Eighteen men in nineteen hours with the aid of the mixing plant, two locomotive cranes and several buggies placed this amount of concrete in the form. One crane supplied the mixer with aggregate which consisted of sand and pebbles, and the other crane elevated the concrete from the mixer to an overhead hopper which supplied the buggies. A 6-in. slump was used on the first base, and although air hammers were used on the outside of the forms, slight honeycomb was present. The outcome of the use of an 8-in. slump on the second base cannot be stated as yet, as the forms have not been stripped. A 3,000-lb. concrete taking about seven bags per yard was employed throughout.

Vibration apparently is the measure by which the desirability of turbine foundations is established. In addition to this, however, there should also be considered the maintenance and reliability of the unit which the structure supports. As the turbine bases at Delray will be of concrete and those at Trenton are of steel, supporting identical units, it is to be expected that within a few years the structure giving the greatest amount of satisfaction will make itself evident.

Removing Compound from Cable Splices

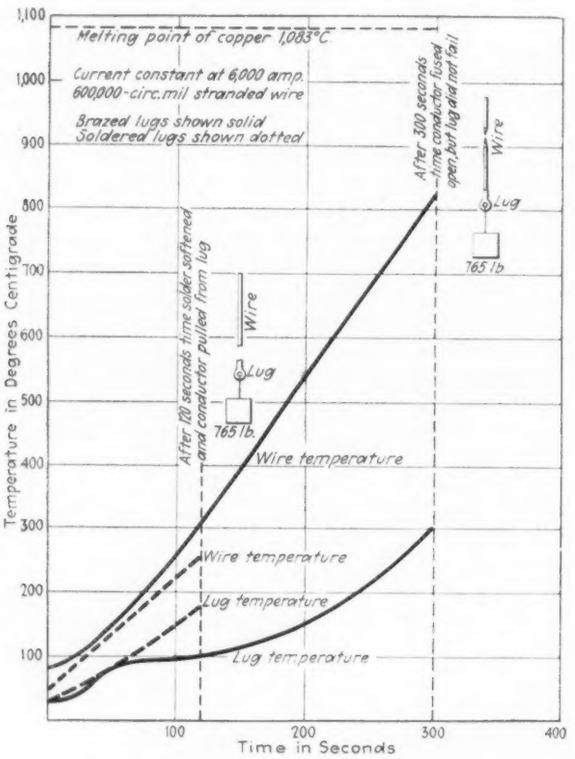
JUST as it is necessary sometimes to untie knots as well as tie them, so it is necessary sometimes to break cable splices as well as make them. After the sleeve has been cut off there remains the job of removing the insulation. If the joint is oil-filled or the compound is viscous the job is easy. But if the compound is a semi-solid, adherent mass that clings to the conductors the job is not so easy. It will probably have to be melted off. Another way of skinning the cat was discovered by a splicer on the system of the Consumers Power Company, Jackson, Mich. He secured a half pound can of methyl chloride and slowly poured this volatile liquid on the compound and thus froze it, hard and brittle. Then with a hammer he knocked it off, leaving the conductors clean. Although methyl chloride is not an objectionable refrigerant for this use, since it is odorless and nonpoisonous, it would probably be wise to provide a means to get the gas out of the manhole as the liquid evaporates.

Brazing Electrical Connections

By D. H. Johnston, Jr.
Superintendent of Electrical Construction
Consolidated Gas, Electric Light & Power Company,
Baltimore, Md.

A SATISFACTORY brazing method has been developed for connections where high temperatures, caused either by abnormal currents or by large heat losses, possibly aggravated by magnetic stresses, make soldered connections undesirable. The joints have proved their worth, both under test and field conditions, for high-voltage work in generating stations where huge short-circuit currents develop and for resistance grid connections where large heat losses are dissipated, either condition contributing to temperatures in excess of the melting point of solder.

The most practical and convenient device yet found for brazing joints in the field is the ordinary oxyacetylene welding torch. A composition metal commonly identified as "7 per cent phosphorus copper" has been found to be the most satisfactory brazing material. This, by analysis, consists of approximately 92.66 per cent copper and 7.18 per cent phosphorus.



Mechanical strength of brazed connections as indicated in temperature tests

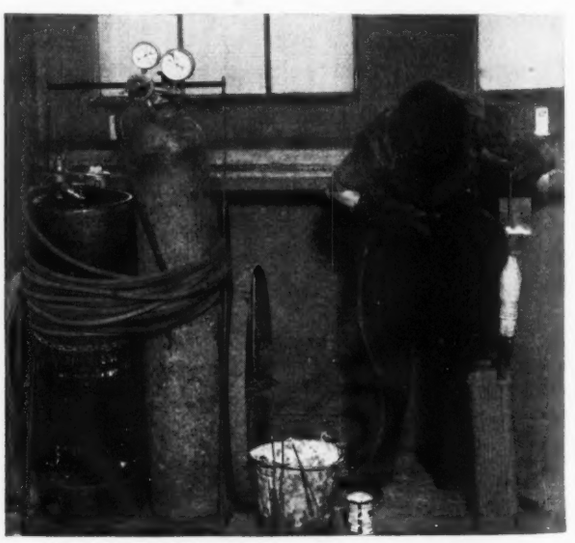
The sample under test was suspended in a vertical position and tension applied by fastening a weight to the lower end. The No. 0000 B. & S. gage solid sections were subjected to a 3,000-amp. test with a load of 365 lb. and the 600,000-circ.mil stranded sections to 6,000 amp. at 765 lb.

The insulation on the conductor is removed and tapered for sufficient length at the end of the wire section to permit insertion of the exposed copper into the terminal. On stranded sections the strands are spread to make contact with the terminal walls, thereby holding the terminal to the conductor in proper position for brazing. On solid sections a paste of carbon and water is packed around the open bottom end of the terminal to prevent flow and loss of molten brazing metal from this outlet. A mixture of commercial 80 per cent magnesium powder and water is carefully molded around the tapered insulation to prohibit excessive damage to the insulation from the heat.

Dissected terminal joint shows homogeneous structure of elements

Comparative tests of millivolt drops across brazed and soldered joints on terminal connections show a small difference in favor of the soldered joint, but sufficiently slight to be well within possible variations found on carefully soldered connections. Similar tests across the bolted flat contact section of the brazed terminal indicated especially high resistance before cleaning. After these contact surfaces were thoroughly cleaned and any slight warping on the brazed terminal portion corrected no difference existed in the two types of joints.

Flat terminal portions, both for brazed and soldered connections, were bent at angles of 45 deg. and 90 deg. to their original positions by hammering. The brazed terminals showed no more signs of weakness than the soldered. Tensile test made on a wire at normal temperature to which a terminal had been previously brazed showed a decrease of approximately $7\frac{1}{2}$ per cent in tensile strength, fracture occurring close to the terminal. The effects, however, of abnormal currents, indicated by tests, are large in comparison with effects produced by brazing and none of the failures at abnormal current values occurred at the terminal, but on the wire at some distance from the terminal.

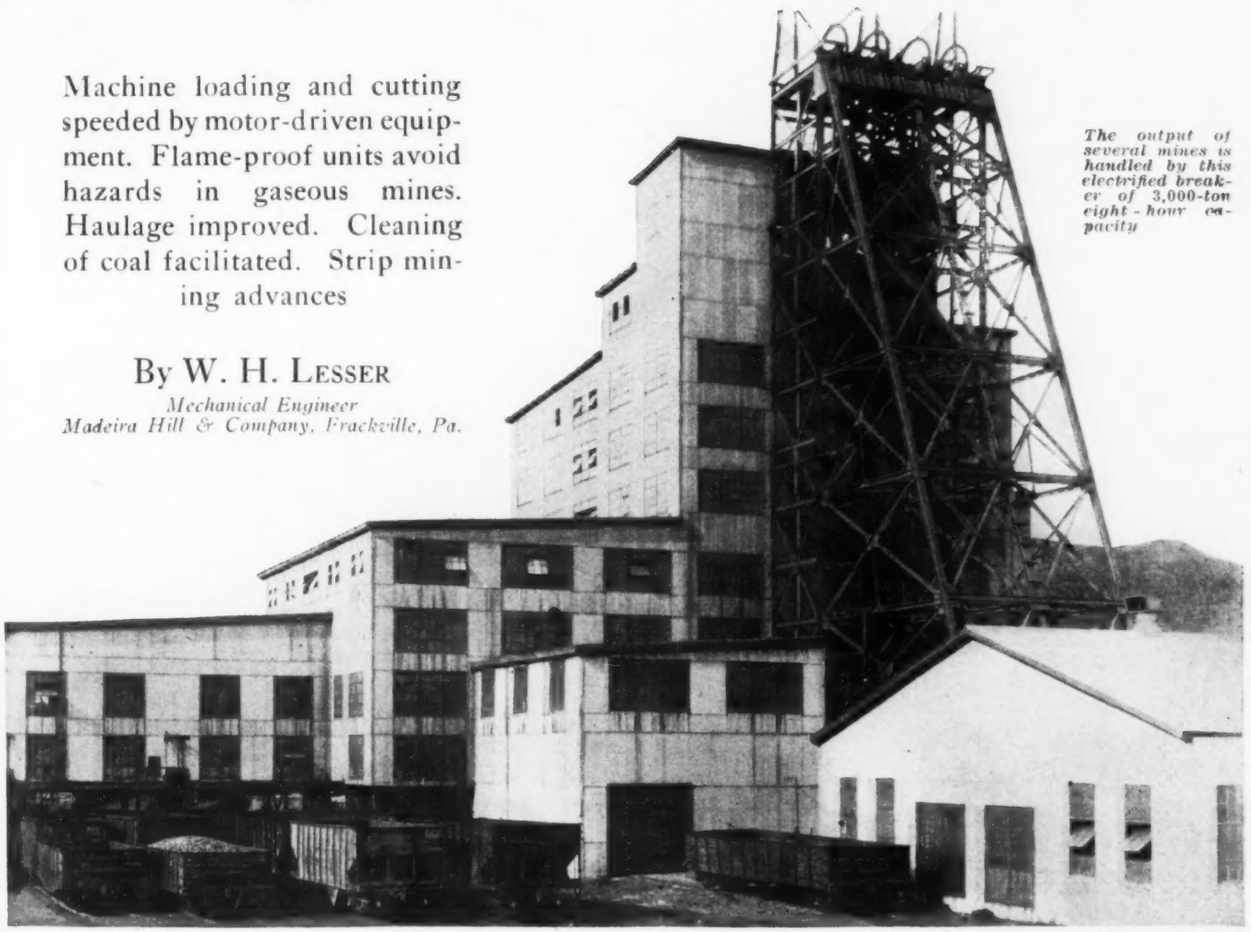


Method of brazing copper wire to lugs

Electricity Is
Cutting Costs in Coal Mining

Machine loading and cutting speeded by motor-driven equipment. Flame-proof units avoid hazards in gaseous mines. Haulage improved. Cleaning of coal facilitated. Strip mining advances

By W. H. LESSER
Mechanical Engineer
Madeira Hill & Company, Frackville, Pa.



The output of several mines is handled by this electrified breaker of 3,000-ton eight-hour capacity

ELECTRICAL energy is contributing largely to the success of the determined efforts being made by management and engineers in the coal mining industry to place that basic activity upon a more sound, economic basis. Lower labor costs per unit of production, lower freight rates and the suspension of high cost mines are some of the factors which will directly and quickly help in the rehabilitation of an industry which seems to be in trouble marketwise the world over.

The loading of coal by electrically operated machines, instead of men, is helping to place the coal mine in a position similar to our great manufacturing plants, where machinery plays such an important part in the general production scheme.

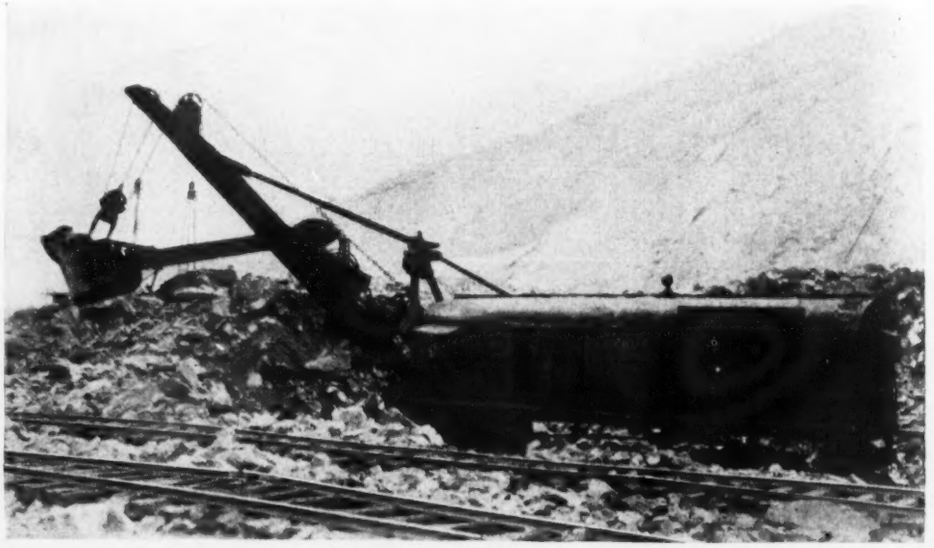
Reports show that about 10,000,000 tons of bituminous coal were loaded mechanically by 455 machines during 1926. The increase in tonnage handled by machines from 1925 to 1926 was between 3,000,000 and 4,000,000 tons and the percentage increase for that period may be placed at about 60.0 per cent. The figures for 1927 are expected to show a marked increase in the number of machines. A corresponding increase in the tonnage will not exist due to suspensions in some of the bituminous producing states. Machine loaded coal in the anthracite field shows no such increase, but the use of many shaking conveyors and scrapers has made it possible to work at a profit certain seams of coal which otherwise would be lost. This type of equipment has enabled many old mines to "carry on" despite the fact that they have little thick coal, but much thin and dirty coal.

The machine age now being instituted in the coal mining industry would hardly be possible were it not for the availability of electricity and the electric motor. Since the electrical equipment on machine loaders must necessarily operate at the working face where the maximum danger from gas and dust explosions exist, motors are designed to operate in a safe manner under such conditions. They are tested in the United States Bureau of Mines, and if approved by it for use in gaseous mines each motor is identified by a plate mounted in a conspicuous place on the frame. This plate also specifies the manner in which the motor must be maintained in order that its permissibility is continued after it is in operation. Flame-proof motors are tested with a spark plug inserted in the motor case, previously filled with an explosive mixture of gas; the motor is then placed in a steel chamber containing a similar mixture of gas and the

gas in the motor is exploded. Motors must be so built as to stand the effects of the explosion without injury or without propagating the explosion to the surrounding gas.

While the main object in permissible equipment is safety, still the item of accessibility should not be entirely forgotten. It seems that some motors have been designed successfully to pass the tests of the Bureau of Mines only, as when it comes to inspecting or repairing them the numerous bolts and studs that must be removed make it quite possible that when the motor is closed up again its permissibility is destroyed due to the omission of a part of it.

The use of permissible equipment is becoming so general in gaseous mines that there is a bituminous mine in operation in which every piece of electrical equipment is of the permissible type. A daily output of 3,600 tons is obtained from the mine, all of which is hauled by approved battery locomotives. Power trucks on which are mounted storage batteries supply the necessary power to the coal-cutting machinery.



Electrically operated loading equipment minimizes mining costs

Economical open-pit mining of 800,000 tons of coal was made possible by this electrically operated shovel

With the concentration of mining and loading in one section of the mine comes also the problem of hauling this increased tonnage. Main line trolley locomotives and the use of larger mine cars are helping to solve this phase of the intensified mining program. A typical locomotive such as is illustrated may weigh 38 tons and be equipped with three 133-hp., 500-volt, direct-current motors with forced ventilation produced by a motor-driven fan. A semi-magnetic control arranged for series-parallel operation of the motors in each direction constitutes the control equipment. At a speed of 7.4 m.p.h. a drawbar pull of 23,333 lb. is developed at a 33⅓ per cent adhesion. Railroading has become so heavy in large mines that comprehensive dispatching systems are being adopted. Telephones are used to distribute the cars and a block signal system moves the trains over the road.

During the past decade there have been some notable examples in the anthracite coal field where the output of several mines has been brought to a central point, at which a breaker was built of sufficient size to prepare the combined tonnage of the mines included in the consolidation scheme. In some consolidations a four-compartment shaft with two hoists handles the same output that was previously accomplished by six slopes, each of which was equipped with a hoist. Recent improvements in the methods of eliminating the refuse from the coal make it possible to design a 3,000-ton breaker in which the entire process of eliminating the slate from the coal is accomplished in four units. In the older system of preparation it would probably require 30 units for preparing the above-mentioned tonnage. In order to maintain production during the eight working hours, under the new order, the mechanical and electrical equipment must function more continuously than under previous conditions. Closer supervision is required on the part of the operating man and greater attention must be given by the manufacturers to the design of the details of the mechanical and electrical apparatus.

Not only in the mines is electricity reducing unit costs, but also on the surface, in great open-pit mining properties. Large electrically operated shovels capable of lower operating costs make it possible to increase the ratio of overburden to coal in mining of this character. The world's largest electric shovel will go into operation this

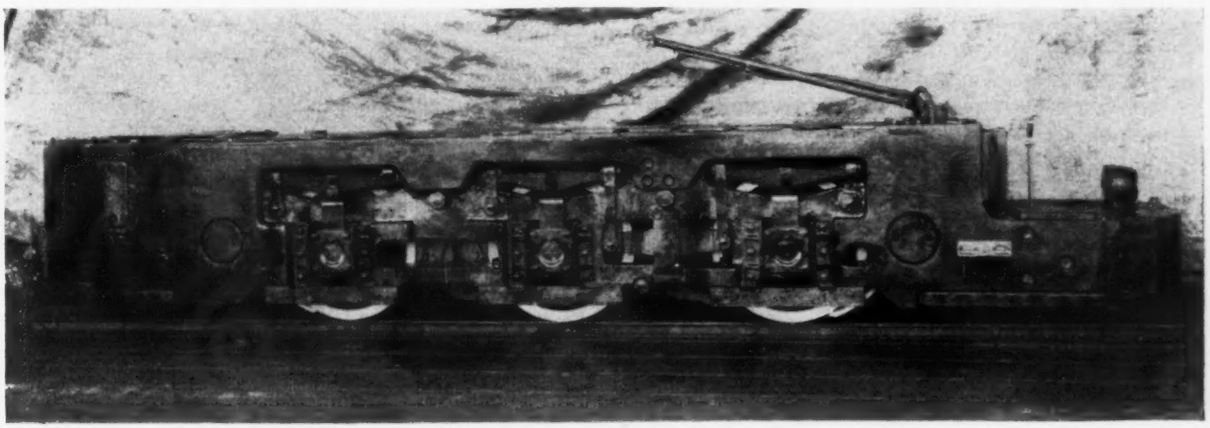
year in the open-pit mines of Illinois. It will be equipped with a 15-cu.yd. dipper on a boom 120 ft. long. Two 450-hp. motors will provide power for hoisting and two 150-hp. motors will do the swinging. Ward Leonard control will be used, involving a motor-generator set whose synchronous motor will have a rating of 1,700 kva.

A shovel in operation in the Morca stripping of Madeira Hill & Company has made economical the open-pit mining of 800,000 tons of coal from a basin 3,600 ft. long, 400 ft. wide and 150 ft. deep. It has a 4-cu.yd. dipper, a 36-ft. boom, a 225-kva. synchronous motor on the motor-generator set and Ward Leonard control. Power is supplied to the shovel at 2,200 volts through a three-conductor cable. Electrical apparatus on shovels is subjected to considerable vibration which causes frequent grounds and we have found that a ground detector is a very important addition to the standard equipment.

is no doubt but that it is economically advisable to move, wherever and whenever possible, toward the goal of a completely electrified mine.

Proper Distribution of Power Important

In large mines the proper distribution of power is one of the important questions in the application of electrical power. We operate one mine in which there are 45 miles of haulage tracks, twelve trolley locomotives, eleven battery locomotives and 42 motors driving shaking chutes and scraper loaders. Power for the loading equipment is transmitted, in some instances, 5,000 feet at 440 volts, three phase and 60 cycles through a three-conductor cable. The direct current for the haulage system is usually supplied by converting apparatus located on the surface near the top of the shaft. In another mine satisfactory direct current is maintained through the use of a portable rotary converter. The



Operation under low ceilings is permitted by this 38-ton electric locomotive

In many anthracite mines 14 and as high as 32 tons of water are pumped per ton of coal shipped, which constitutes a pumping problem of no mean proportion. A typical mine has a capacity of 18,000 gal. against a head of 400 ft., and it is necessary to operate the entire plant during times of high water. During periods of low water the mine produces only 1,500 gal. of water per minute. Some emergency pumping plants are located in wet sections of the mine, where the sump layout is such that they can be operated only when high water exists, which may happen for a period of one month during a year.

Under conditions like this, all metal parts of the control and switches rust quickly and extraordinary supervision must be given to these installations or they will not be in condition when the flood period arrives. To protect the equipment from deterioration under conditions such as these a steel house, heated with bayonet heaters, may be built around it at a small cost. Automatic pumping plants in the anthracite field number about 200 and represent an annual saving in labor of approximately $500,000.

The rapid adoption of electrically driven loading machines at points several thousand feet from the shaft bottom, the use of small dip pumps in isolated places, tugger hoists and booster fans are all examples demonstrating the flexibility of electricity as a form of power especially adapted to mine work. Generally speaking, and having in mind a colliery partially electrified, there

transformers, switchboard and control are mounted on trucks with the same gage as the mine track. A movement of a portable converter with a capacity of 200 kw. is contemplated every six months and experience shows that a move can be made in two hours.

Cable Tramway to Span Western Canyon

By A. F. Gettelman

Industrial Control Engineering Department, General Electric Company

A MAMMOTH electric tramway erected by the Michigan California Lumber Company at Camino, Calif., will be used to carry lumber across a deep canyon a distance of ½ mile. A single loaded tram car constituting a maximum gross weight of 29 tons will travel between two loading terminals on opposite sides of the canyon. The maximum speed of operation will be 1,800 ft. per minute and the carrier will make a round trip in a little more than six minutes. This cycle may be maintained continuously. Two 225-hp., wound-rotor, intermittent-duty hoist motors operating electrically and mechanically in parallel and equipped with motor-mounted solenoid brakes will constitute the motive power. The primary windings of both motors are tied together and connected to the primary reversing panel, while the slip rings on

each motor are connected to a separate resistor and set of eight triple-pole accelerating contactors on the secondary panel. Relays for undervoltage and lockout protection are mounted on the latter panel. Time-limit control is provided by means of pendulum type interlocks mounted on the accelerating contactors.

The tram car is controlled by the operator on the power side of the canyon from a master switch. When the car is to be moved from the power side to the far side the motors are connected for regenerative braking and the car is lowered into the sag. When the middle of the cable is reached the motors automatically return to motor action and hoist the car out of the sag. The car is stopped at the loading platform by means of a limit switch geared to the traction drums. The final limit on the switch disconnects the motors from the power supply, setting the solenoid brakes and lighting a red and a green indicating light on the "jog" push-button station in front of the operator at the master switch on the power side. The unloader on the far side of the canyon has a "jog-return" push-button station connected to the control equipment. When the car has stopped the unloader brings it up to the exact unloading position by means of the "jog" button. As soon as this button is pressed the green light in front of the operator goes out and the control is locked out so that the operator cannot interfere with the unloader or return the car too soon.

Remote Control and Signals

As soon as the unloader is ready to have the car returned to the power side he presses the return button, lighting the green light and thereby signaling to the operator that the car is ready to be returned and that the control is returned to him.

While the car is crossing the canyon in either direction emergency stops can be made. The jog push button at each landing is so connected that it cannot be used until the limit switch has stopped the car at that landing, thus removing the danger of some one pressing the button while the motors are regeneratively braking and causing a dangerous overspeed. By closing a switch the jog buttons can be used the entire length of travel if desirable.

This installation is designed as a special job, but shows the adaptability of electrical applications to lumber operations.

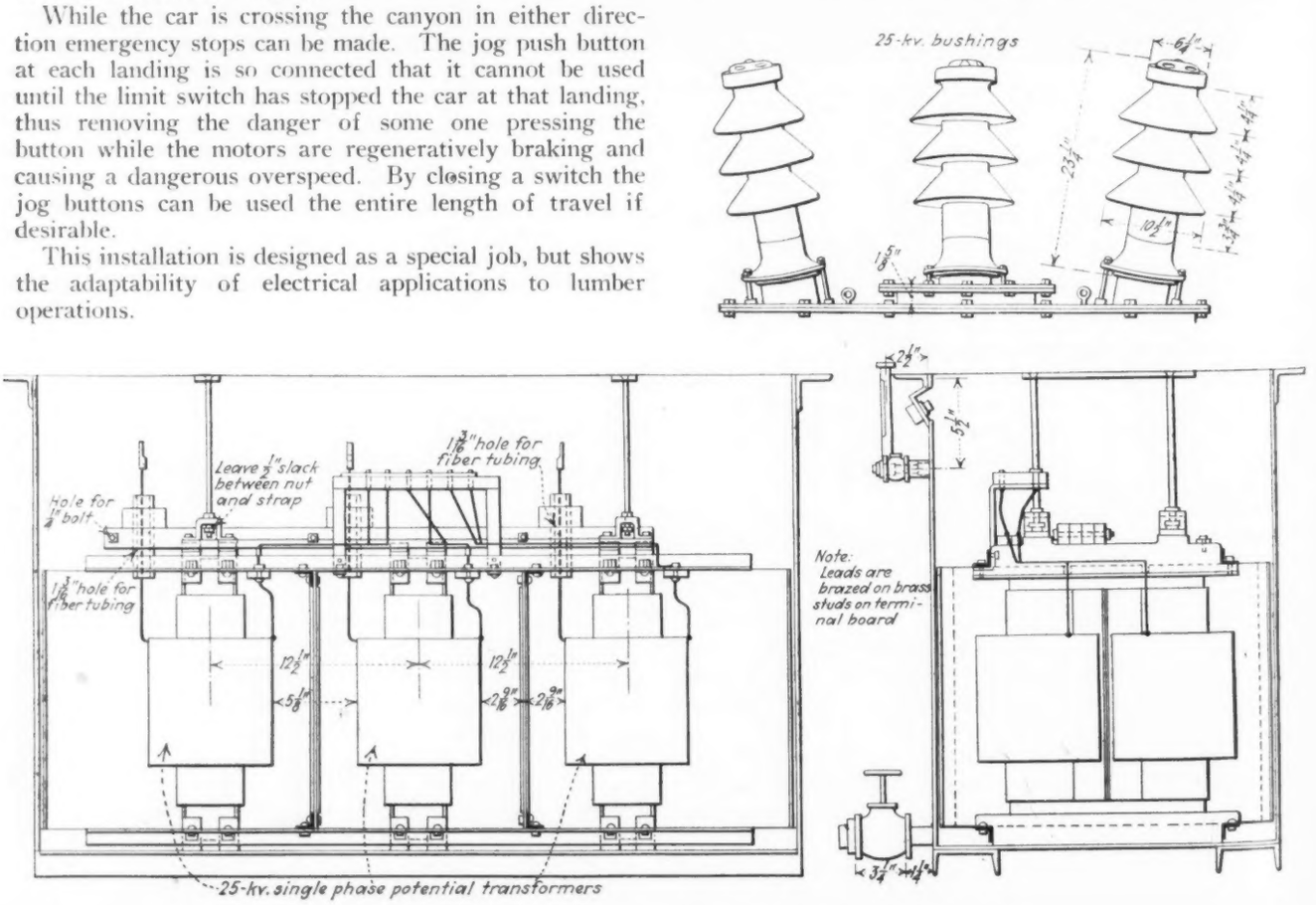
Single-Phase Potential Transformers Rebuilt for Three-Phase Use

By H. A. P. Langstaff
Relay Engineer West Penn Power Company, Pittsburgh, Pa.

THE 25-kv. control equipment of the West Penn Power Company has been materially modified in the past few years in order to satisfy the increased capacities involved in the growth of the system. These changes include transferring practically all of the 25-kv. switchgear from the older type indoor stations to outdoor stations. Higher capacity breakers replace the older indoor equipment and the latter is used for the control of low-tension circuits, thereby providing breakers of sufficient capacity to last for several years to come.

Along with this change to outdoor equipment, it is necessary to have outdoor potential transformers, and inasmuch as there was already in service quite a number of single-phase potential transformers indoors, we found quite a saving could be made by removing the cores and windings from the old indoor tanks, purchasing new tanks sufficiently large to allow for the assembly of three of these transformers in the one tank and equipping the same with three older type outdoor bushings removed from a discontinued type of lightning arrester, many of which we had available. This meant, of course, that the only new equipment necessary to purchase was the tanks and fittings.

The type of relay protection used made it necessary that we have three-phase YY connected 25 kv. to 110-volt potential transformers and the above scheme involved a considerable saving for this company.



Old equipment used with economy by provision of tank and fittings

A New Era in Use of Coal?

Second International Conference on Bituminous Coal raises many questions regarding future consumption of fuel. Chemistry to play major rôle. Pulverized coal, boiler design, ash and slag problems considered

LOW temperature carbonization of coal received a large amount of attention at the Second International Conference on Bituminous Coal, held in Pittsburgh throughout the week of Nov. 19-24. The economic folly of burning raw fuel, thus wasting valuable by-products, combined with the potential savings in generating costs by reduction of capital expenses, largely through use of one station for gas and steam production, make the possibilities of great future interest to utility men. This was emphasized by M. Alpern, president of the American Engineering Company, and A. R. Smith of the General Electric Company, while warnings against undue optimism or pessimism were given by C. H. Lander, Director of the Fuel Research Board of England.

Fixed Charges May Be Reduced

"Into the economy of steam making at central power stations many factors enter," said Mr. Alpern. "Besides fuel cost and fuel efficiency, there are factors having to do with overhead and operating expense, the fixed charges of the plant, that are equally important. These are influenced by the type of fuel used. Carbonized fuel suitably prepared by methods designed for the purpose may have certain burning characteristics that influence favorably these items of fixed charge and operating expense. For example, they will tend to lower the installation costs by lessening required furnace volumes, are likely to lessen fixed charges by improving the capacities attainable with high efficiency, and may lower the labor cost and repairs and replacements by increasing the smoothness and steadiness of operation. These factors appear to offer possibilities of supplementing the gains derived from by-product recoveries and improved furnace efficiencies to a degree that may eventually counterbalance the costs and losses and save the day for pre-carbonization at power plants. They have not yet, however, been fully demonstrated.

"Increasing co-ordination in control of gas and electric utilities, together with growth of the central-station idea, will afford opportunity for development of carbonization auxiliaries at power stations. Gas plants supplying city gas, particularly those having equipment for blue water gas or producer gas manufacture, can make good use of the rich gas arising from low temperature carbonization. . . . It is low-temperature carbonization, rather than high, that appears best adapted to the preparation of boiler fuel.

"Within my knowledge there are four different systems now in operation, either on a small commercial scale or experimentally, in which the fuel is transferred directly from the retorts to some form of stoker, and there is in operation a fifth system in which the fuel is transferred to a form of mechanical stoker, but not directly."

In speaking similarly of future possibilities, with special reference to the use of gas fuel, Mr. Smith said:

"Whatever may be acomplished along the lines of improving the heat cycle should not prevent an attempt to introduce new combustion cycles which may lower the cost of fuel chargeable to the power plant or lower the investment of the power plant, because new combustion cycles may be the means of introducing new heat cycles. By 'combustion cycle' I mean the cycle whereby fuel and oxygen are put together for the purpose of producing heat. The idea of returning some of the heat from the products of combustion by preheating the air is in a sense a different cycle than when no preheat is used. The use of heat from the products of combustion to heat the fuel, the idea of first gasifying the coal and then burning the gas, and two-stage combustion are other cycles.

"If we can successfully segregate coal into its component parts at a high thermal efficiency and with a reasonable investment it may present oportunities to lower the cost of fuel chargeable to power and possibly lower the investment cost of the power plant. There are two interesting methods: First, to produce as by-products domestic coke, tar, oils and gas and to burn the coke breeze or any of the residue fuel for making power, thus materially reducing the cost of fuel for power, but not lowering the investment cost of the power plant. Perhaps the most serious objection to it is that several times as much coal must be carbonized as would otherwise be needed for producing power, which tends to make the power plant secondary to the coal carbonizing plant. The second method, which has considerable promise, is to gasify the coal completely, extracting the tar oils or the light oils for sale and using the gas for the generation of power. Such a method would not reduce the cost of fuel chargeable to power as much as the first-mentioned method, but it would open up innumerable opportunities for reducing the boiler room investment.

"If a dustless, ashless gas, regardless of calorific value, were available, the boiler design might be altered materially; the combustion temperature might be increased; the size of the combustion chamber reduced; more radiant heat-absorbing surface might be introduced and the gas passages changed to advantage. In brief, there is much latitude for the boiler designer to produce a high-pressure steam or mercury boiler of high efficiency and low initial investment."

Combustion of Pulverized Fuel Analyzed

"One of the reasons for the steady progress in the burning of pulverized bituminous coal is the fact that the rate of combustion and the air supply can be as easily controlled as in burning gaseous fuel or oil," said Henry Kreisinger, research engineer Combustion Engineering Corporation, in discussing the process of fuel combustion.

"Pulverized coal consists of particles varying in size from about 1/100 of an inch to 1/1,000 of an inch, the average size being about 1/400 of an inch. Even the smallest particles consist of a very large number of mole-

cules which cling firmly together. The size of an oxygen molecule is about 1/100,000,000 of an inch. The average size of coal particles is then about 250,000 times greater than the oxygen molecules. This comparison of sizes gives an idea of the very large number of molecules an average size coal particle contains and of the very large number of oxygen molecules required.

"Only a small part of the coal particles can be set free as individual molecules during the process of distillation and burned in a somewhat similar way as fuel oil. The remainder of the combustible stays in the particle as fixed carbon and must be burned by bringing oxygen in contact with the surface of the particle. The molecules of fixed carbon are also very complex; that is, each molecule consists of many atoms, so that a large number of oxygen molecules are required to burn a molecule of fixed carbon. The coal particles upon their entry into the furnace are heated at first slowly by radiation from the flame in the adjacent part of the furnace. This heating starts the distillation of the volatile matter, and when this volatile matter and the primary air have reached the temperature of 900 to 1,200 deg. F., the volatile matter bursts into flame.

"At an ordinary furnace temperature the combustible burns as fast as oxygen is brought in contact with it. It is evident that if high relative velocities between the coal particles and the surrounding air are to be produced a force must be provided in the form of kinetic energy. The mixture of primary air and coal and the secondary air is blown into the furnace with velocities between 60 and 150 ft. per second."

Catalysis May Be Important Factor

The paper prepared for presentation by Prof. A. G. Christie of Johns Hopkins University covered the proper design of boiler furnaces, with particular reference to recent developments, and pointed out that "Bituminous coal varies widely in composition and these variations require modifications to be made in furnace design in order to secure its best combustion. . . . One of the most significant factors in recent stoker and pulverized coal developments is the great increase in efficiency at high ratings. At the Huntley station, Buffalo, the combined efficiency of boilers and economizers does not fall below 85 per cent at any rating up to 500 per cent. These results are significant of the remarkable progress in combustion methods, furnace design and disposition of heat-absorbing surfaces that has taken place.

"Increased knowledge of chemical phenomena suggests the idea that some refractories may have catalytic effects on the combustion of coal. Little definite information has been developed along this line. Some work has been done to determine the effect of refractories in catalyzing sulphur dioxide, SO_2, to sulphur trioxide, SO_3. The studies so far undertaken, while establishing the fact that there is a larger percentage of SO_3 in flue gases than is generally appreciated, have not definitely proved that the formation of this gas is due to the catalytic effect of the refractory walls. Tests at Calumet station, Chicago, showed that the amount of SO_3 in the flue gases was greater than SO_2 with powdered coal burning and both were greater than with stokers on the same coal. It is quite possible that the ash in the coal itself may have a catalytic effect on combustion.

"One of the most troublesome features of powdered coal furnaces is the ash in the coal. The greater part of the ash is carried away as a fine dust in the chimney gases. The use of water sprays is under development and promises to remove a greater part of this dust in a cheap and simple manner. Tests of spray washers at Calumet station indicated that 90 per cent or more of the dust was removed. In looking toward future trends Professor Christie's paper ventured that, "In general, furnaces will be built to secure maximum heat generation per cubic foot of furnace volume with minimum excess air quantities and hence high CO_2. As a consequence, the highest possible furnace temperatures will be developed, and this will lead to increased heat transfer and improved efficiency. All furnace walls will be water-cooled to permit these desired operating conditions at high ratings, and this construction may be expected to become standard practice. Ash difficulties may be lessened by better raw coal preparation at the mines.

"The development in powdered coal equipment forced stoker manufacturers to make such improvements in stoker and furnace construction that the competition between two forms of firing is now intense. Future development will provide still greater turbulence in stoker furnaces as well as in those for pulverized coal.

"The end of improvement in equipment for burning bituminous coal is not yet in sight and one may look forward to the development in the near future of still better, simpler and cheaper furnaces."

Ash Removal in Molten Form

A recent tendency toward the use of coal with a low fusion temperature ash was referred to in the paper by D. S. Jacobus, advisory engineer of Babcock & Wilcox, and E. G. Bailey, president Fuller Lehigh Company, stating, "The latest and most interesting method of removing ash from a pulverized coal furnace is to tap it out in a molten condition. By locating the burners near the bottom of the furnace and properly directing the flame against the pool of molten slag which accumulates on the floor, very effective combustion is obtained. The entire accumulation of ash resulting from that which drops out of the flame, flows down the walls and drops from the boiler tubes, can be kept in a molten condition. This molten ash is entirely free from carbon and is readily handled by striking the stream of slag with water jets which break it up and deliver it in granular form to a sluicing system."

The clinkering problem and the relation of coal composition to it was the subject of the discussion by Thomas G. Estep, professor in mechanical engineering, Carnegie Institute of Technology, who concluded that, "There are so many factors entering into the subject of clinkering of coal ash in boiler furnaces that it is very difficult to arrive at anything but very general conclusions from the very limited amount of data available. The type of furnace and stoker, the rate of combustion, the fuel bed temperature, the size of the coal, the distribution of the air supply, the furnace volume, the relative amounts of water cooled and refractory wall surface, the load conditions to be met and the skill of the boiler room labor are all factors in the problem of clinker formation entirely independent of the coal characteristics.

"There is no relation between the silica in the ash and the ash fusion temperature; the percentage of coal sinking or floating in a solution of 1.35 specific gravity and the fusion temperature of the ash; the amount of lime (CaO) in the ash and the ash fusion temperature; the clinker expressed as a per cent by weight of the original coal and the ash fusion temperature of the float portion; or the clinker as a per cent by weight of the original coal to the per cent by weight of the pyritic sulphur."

Ordering Cable Lengths

By Max Kushlan*
Boston, Mass.

IN ORDERING cutting lengths of cables it is important to group the lengths on each reel in such a way as to make them easy to handle and to avoid carrying the same reel to different floors or locations. A method used on a recent generating plant job to arrive at the proper reel lengths is illustrated herewith by typical computation sheets made in the field.

Weights of Cables (Pounds per 1,000 ft.)
Lengths of Cable Within 300-500-Lb. Limits

Size	No. Conduct.	Insulation	Lb. per 1,000 Ft.	Ft. in 300 Lb.	Ft. in 400 Lb.	Ft. in 500 Lb.	Dia. Cable
250,000 C.M.	1/c	2/64 K	1110	270	359	459	1.10
1 0	1/c	3/64 K	540	555	721	943	0.90
4	1/c	7/64 K	260	1154	1500	1962	0.67
8	1/c	7/64 K	140	2143	2786	3643	0.51
19 22	1/c	3/64 K	70	4286	5572	7286	0.35
19 22	7/c	3/64 K	490	612	796	1040	1.10
19 22	12/c	3/64 K	840	357	464	607	1.44
19 22	19/c	3/64 K	1330	226	294	384	1.70

CABLE REEL SUMMARY

Reel No.	Wire Size & Insul.	Fdr. No.	No. Wires	Wire Length (In Ft.) Ea. per Fdr.	Total per Fdr.	Ea. per Reel	Total per Reel	Wire Wt. per Reel
ID-1	250,000 C.M. 1/c-9/64k	7551	3	67	201			
		7553	3	21	63	88'	264'	295#
ID-2	250,000 C.M. 1/c-9/64k	8551	3	34	282			
		8553	3	21	63	115'	345'	385#
F-10	#19/22/19/C-3/64k	8556	1	112	112			
		8557	1	154	154			
		8559	1	26	26	232'	292'	388#

Note: Reels for feeders with three wires to be ordered cut in three lengths, wound parallel on same reel; thus for reel No ID-1, order three pieces 88 ft long each, wound parallel to make up a total length of 264 ft.

Feeder lengths to be cut in the field.

Allocation of cable reels to job

A conduit and wire schedule is shown for a group of feeder and control wires in the boiler house. On this are listed each feeder concerned, its origin and destination and the major conduit, wire and pull box information required. Definite and accurate data are thus tabulated and the chances of errors or delays minimized.

A table of cable weights used in computing maximum

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FEEDER SCHEDULE

ESTIMATE NO. 25
SHEET NO. 1
OF 3 SHEETS
JOB
ESTIMATED BY
DATE Aug. 2, 1928.

Feeder No.	For	From	To	Conduit Size	Conduit Length	Conduit Lb.	Conduit Term.	Conduit Bends	Wire No. Wires	Wire Size	Wire Length	Length of Wire	Wire Insul.	Pull Boxes
5551	Fdr.	Major Switd.	F.D. #1 Cont.	3I	74'			4	3-1/c	1/0	240'	80'	3/64K	—
5552	Fdr.	I.D. #1 Cont.	F.D. Motor Bd.	2I	13'			2	3-1/c	4	51'	17'	7/64K	—
												17'		
8555	Spare	I.D. #2 Cont.	Bailey Con.	2I	35'			2	None					—
8556	Con.	Major Switd.	Gage Bd. #2	3I	105'			5	1-3/c	9/22	112'	112'	3/64K	1
8557	Con.	Gage Bd. #2	Bailey Con.	3I	148'			10	1-7/c	19/22	154'	154'	3/64K	2
8559	Con.	I.D. #2 Con.	Push Button	2I	21'			2	1-19/c	19/22	26'	26'	3/64K	—

Legend:— F.D. = Forced Draft Fan; I.D. = Induced Draft Fan.
Cont. = Contactor; Con. = Control; I. = Iron; K. = Kerite
1/c - Single Conductor; 7/c - Seven - Conductor.

Feeder schedule for boiler room

lengths of any given cable per reel not to exceed 300, 400 or 500 lb. is shown, the weight of the reel being excluded. These limits are checked with maximum lengths due to space requirements and depending on the cable diameter. In most cases the weight will be found to be the determining factor. A computation sheet used in field work is also illustrated. This is based on the first two tabulations, grouping the wires so as to limit each reel to a single location, and keeping the weight of wire per reel not excessive for convenient handling.

In conduits requiring three wires of equal length it is desirable to order three parallel lengths wound on the same reel. This method may be extended to any number of wires in a conduit within the maximum limit that may be wound on a single reel.

Tractor Used as Backfiller and Puller

By Theodore R. Eilenberg
Structural Engineer
New York & Queens Electric Light & Power Company

GAS-POWERED tractors are used by the New York & Queens Electric Light & Power Company for towing and backfilling trenches by equipping them with a large scraper plow. This plow is raised and lowered by the operator of the tractor by means of a hand wheel mounted above the steering wheel. After the plow is lowered the tractor is maneuvered to a position at a slight angle to the trench and used to push the backfill material that is on the surface into the trench.

By attaching a wooden trailer to the tractor all heavy material, such as castings, timbers, sand, stone, cement, etc., can readily be hauled from one point to another and the additional labor of loading and unloading to and from a high body truck is eliminated.

Backfilling a trench and pulling loaded sled with a tractor

INDIANAPOLIS POWER & LIGHT CO.
Commercial Department Assignments

Date October 29, 1928

Name	National Manufacturing Company
Address	1647 Walnut Street
Party to see	Mr. E. L. Baker, Manager
When to see	This week
Nature of job	See about bettering lighting conditions to increase production.
Assigned to	J. R. Smith Assigned by B. R. McArthur

Report must be made at least once per week, in writing, on separate card, unless completed. If job is completed make note on reverse side of this card, giving full information. Assignment to be made in triplicate, the original to Commercial Department office, duplicate to salesman, triplicate to Commercial Manager.

Form 86 2-1-28

Commercial Department Report

Name	National Manufacturing Company
Address	1647 Walnut Street
	Called on Mr. Baker and found he desired better lighting in this machine shop. Have his building layout and am now designing proper lighting. Will complete it by next week.
Date	October 31, 1928 Signed J. R. Smith

Brief report of progress to be made of each job weekly

Record of assignment of work on left and salesman's report of progress on right

Following Up Commercial Assignments

By Roy Thurman
Indianapolis Power & Light Company, Indianapolis, Ind.

THE commercial department of the Indianapolis Power & Light Company has been using, since about the first of the year, a method of assigning, controlling and checking up the work of the various members of this department which has proved to be of considerable value to the salesmen, as well as the commercial manager.

Only two forms are required. The first, as shown on the left in the accompanying illustration, is the assignment record and is in triplicate. The work to be done in connection with any commercial department activity is assigned by the commercial manager or the clerk of the department and may be as a result of a phone call from the customer, special work delegated by the commercial manager or new business initiated by the salesman himself. The original of the assignment goes to the clerk of the department, the duplicate to the salesman and the triplicate to the commercial manager.

The second form, shown on the right, is a report card and is used by the salesman in reporting progress on each assignment weekly. This weekly report of work accomplished is turned in to the clerk, who prepares a résumé of all department activities for the executives of the company, and is then sent to the commercial manager's file of assignments, where it is attached to the assignment card held there. When the job is completed, the final report is made on the reverse side of the salesman's assignment form, and both the clerk and manager's files are cleared and all the records are consolidated and sent to the completed work file.

In several months' use this system has been found to be simple in operation and satisfactory as to results. The time required to take care of the reporting and filing is not burdensome and is more than compensated for by time saved in other ways.

Since a written record is made of all work to be performed, it cannot be forgotten, and even though the salesman's assignment card is lost, the two other files will bring the job to his attention.

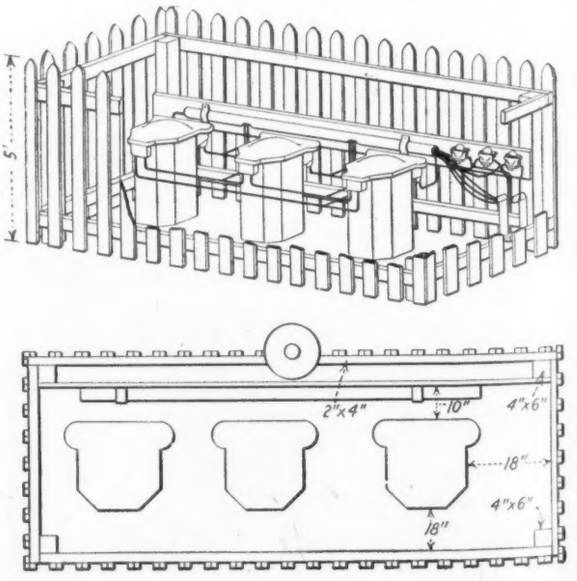
The salesman is furnished with a leather pocket folder for his assignment cards, and having them with him at all times he is able more effectively to plan his work and more satisfactorily serve his company's customers.

The commercial manager is able to keep in closer touch with all the activities of his department. From the weekly reports he can become acquainted with the progress on each assignment and suggest methods to be followed to bring the work to a successful conclusion. He is not seriously handicapped if some of his salesmen are absent or leave the employ of the company, for his file will show just what has been done in any particular case. He is able to determine quickly who is handling any work about which information is needed. It is possible for him to avoid having several company representatives contacting with the same customer or prospective customer. One salesman only is assigned to one job and is responsible for that work.

Periodically the file is checked with the salesmen and any assignments not active but requiring future attention are set forward to be reassigned at the proper time.

This system has shown itself to be workable, efficient, effective and satisfactory where a number of salesmen are taking care of the numerous duties of a central-station commercial department ranging from complaints and small lighting installations to elaborate power surveys.

Transformers Installed on Ground



Construction standards Worcester Electric Light Company

Employees Acquire Great Selling Agency

Graybar Electric Company passes into hands of officers and employees who were responsible for its rapid growth

Based on an Interview with
F. A. KETCHAM
Executive Vice-President Graybar Electric Company

F. A. Ketcham

THERE is nothing new or revolutionary about the acquisition of even a large portion of the stock of a corporate enterprise by its employees. Nor is the acquisition of outright control of individual concerns by their employees by any means without precedent. But the transfer in one transaction of complete ownership of an enterprise of the magnitude of the Graybar Electric Company to its officers and employees is a business event of major interest and concerns the entire industry.

It is natural to suppose that the possibility of the sale of Graybar Electric by its owner, the Western Electric Company, might have induced in the minds of the company's officers some such sequence of ideas as: Who will be our next employers? Will our pension and sick relief be continued? Will the company's liberal policy in other regards be perpetuated? Why should not we, the officers and employees who have built up the enterprise, be its future owners? Whether or not this was the actual trend of ideas is immaterial. The fact is that the initiative came from within, and was coincident with the parent company's decision to confine its activities strictly to the telephone field. Negotiations followed. An agreement was reached, with the result that before the end of the year the company will be in the hands of its new owners. A new and modern experiment in corporate management and ownership will have been launched.

Loyalty Facilitates Transfer

The transaction seems entirely logical. In this particular case, in addition to the fact that there was but one stockholder to deal with, there seems to have been an unusual degree of solidarity in the body of employees. For one thing an exceptionally large percentage of the officers and employees have literally "grown up with the business." Sixty-one of them have each spent a quarter of a century or more with the enterprise. Of the others, 102 have more than twenty years of service and 373 have ten or more. Well over half of the company's employees, or more than 1,000, have been with the company for at least five years. Officers estimate the average length of service for all employees is about fifteen years.

Another factor of importance is the company's policy in regard to relations with its officers and employees. There was a carefully worked out pension policy. Furthermore, a liberal distribution of extra compensations enabled the employees to share substantially in the earnings. There is also sick relief. Casual conversation with one young salesman elicited the fact that he had been taken ill in a customer's office in the West. On learning this, his company took complete charge of hospital and other arrangements. It notified his mother and dispatched her to the hospital. This salesman naturally became an enthusiastic booster for Graybar. All this is cited merely to show how those employed by the Graybar Electric Company are essentially a part of the enterprise. It shows how natural it is for this body of employees to acquire ownership of the company when its former owner, the Western Electric Company, decided to dispose of it to devote more of its attention to the telephone business.

When asked about the possibility of any individual or group among the officers later acquiring control, Mr. Ketcham showed that this would be impossible by outlining the plan of purchase. Each individual who has been with the firm at least six months is invited to subscribe to a certain percentage of his annual income in the new stock, according to the length of his service. He may purchase his stock outright for cash, by annual installments over five years, or by deductions from his salary over a period. Private financing has been arranged to carry this out. The company will be capitalized at $9,000,000, of which $3,000,000 is common voting stock and $6,000,000 is preferred, non-voting stock. The entire common stock will be owned by Graybar employees and the preferred will remain in the hands of the former owner for the present. The latter stock will be retired over a ten-year period allowed for this amortization. Employees will be assured of perpetuation of their pensions as well as sickness and other benefit plans.

Outlook for the Jobber

There was just one more question that hadn't been answered and Mr. Ketcham's reply is of significance in relation to the whole transaction. It had to do with the alleged trend toward the transfer of goods direct from producer to consumer or retailer. If there is such a trend, what is the future outlook for the jobber? "We are convinced," was Mr. Ketcham's quick reply, "that we are performing an economic function. We are intimately in touch at all times with 200 manufacturers whose products include practically all lines in the electrical industry. In some cases we take their entire output. Our 71 distributing houses, located at strategic points across the country, constitute a convenient and dependable service. We have approximately 600 salesmen selling some 60,000 items of merchandise to over 35,000 customers. This and our rapid growth show the function we perform.

A Newspaper Editor on Utility Publicity

"I AM NOT afraid of your propaganda for private ownership of electricity, of gas and water rights. I am not afraid of Gifford Pinchot's propaganda for public ownership.

"Neither does the daily grist from the Anti-Saloon League, the Plumbers' Association, the brick manufacturers and the eat-more-alfalfa-daily press agents cause me to lose any sleep. I know propaganda when I see it.

"Keep the propaganda coming. Everybody else is doing it. The public relations man today must be clever indeed to make his work stand out in such a way that it will get attention in a welter of indifferently written and poorly printed material.

"Base your public relations policy on the theory that the public is entitled to all of the facts. Give information. Give it all. Give it exactly and present it in a way that the lay mind can get a picture of it. Be as quick to get unfavorable things about your utility to the newspapers as you are to rush to the papers with information you think the people ought to have.

"Your state committees have done a great work. A decade ago the cry against you was that you were a secretive lot who took all and told nothing. Now the Federal Trade Commission is on you for telling too much.

"There are probably 14,000,000 utility customers, investors and employees in the United States. Activities of these groups, the facts about the business units are legitimate news which editors are looking for. My personal opinion is that more business news is a splendid antidote for prizefight ballyhoo and Chamber of Commerce 'balony.'"

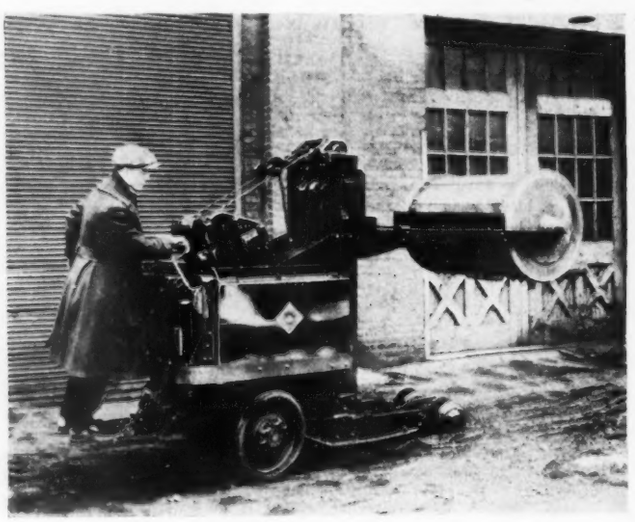
WALTER M. HARRISON,
President American Society of Newspaper Editors.

In the early days most of us had to do with the telephone and supply business, and as the former was one not of sales but of service, we learned the value of service to the customer, which must, of course, be combined with sales if a business is to be successful. When Graybar took its new name, just three years ago, we were operating in 55 cities. Today we have 71 locations, which indicates, I believe, that the demand for the type of service we as distributors are rendering is constantly growing. Not only do we render a needed service to the consumer but we take a great burden off the shoulders of manufacturers, as is evidenced by the increasing number who come to us and ask us to take over their distribution."

Mr. Ketcham cited also the company's earning progress as evidence of the function it performs. In 1926, the first year of its operation as Graybar, a separate entity from Western Electric, business increased more than 15 per cent and its total business in 1928 will be almost $75,000,000. Graybar will continue to act as exclusive distributor of certain Western Electric products in the United States to customers other than the Bell System. These products include telephone apparatus, carrier-current and train-dispatching equipment, telephone cable, radio loud speakers, public address systems, broadcasting stations, scientific equipment, etc. The company will likewise continue to expand its merchandising business, consisting of the sale of Graybar marked devices, such as radio receiving sets, washers, ironers, vacuum cleaners, fans, lighting fixtures and other appliances.

Industrial Trucks Meet Process Requirements

Castings receive minimum handling at the plant of the Cleveland Manufacturing Company. The tumbling barrel is brought to the castings for direct loading on an Elwell-Parker industrial truck, the barrel serving as a container and eliminating transfer of material. The use of a 3-ton truck with an all-steel skid loaded with hot drop-forged crankshafts reduces time intervals between processes at the Cleveland City Forge & Iron Company.



Special material-handling applications served by electric trucks

Suggests

Single Holding Company

for New England

By PHILIP CABOT

Professor of Public Utility Management, Harvard Graduate School of Business Administration

Economic outlook improving. Maximum volume of power sales essential to proper development. Central load dispatching and complete interconnection important objectives

A suggestion that all the operating power companies in New England might be advantageously combined in a holding company to facilitate the supply of electrical energy under the most favorable prices to stimulate industrial development was presented at the power session of the regional meeting of the American Society of Mechanical Engineers at Boston, Mass., recently by Professor Cabot, in discussing a paper by Col. F. M. Gunby of Chas. T. Main, Inc., consulting engineers, Boston, on "Power Supply for New England Industry." Professor Cabot's comments on the New England industrial situation and the relation of power supply to its economic prosperity were in part as follows:

"COLONEL GUNBY'S paper shows that during the last few years the use of industrial power has increased at the rate of from 1.5 to 2 per cent per annum, in spite of the fact that during that period the depressed textile and shoe industries have lessened their power consumption. The situation has only been saved by the growing use of power by other industries. This is a condition which in my judgment is temporary.

"The boot and shoe industry already shows signs of improvement. The cotton textile industry of New England has been brought to its present condition by unskillful management. This may have been because the managers followed the teaching of the theoretical economists as to the operation of the 'law of supply and demand.' This so-called law is very misleading; in fact, the most recent studies on the subject seem to indicate that there is no one law of supply and demand, but several. Moreover, the problem of dominant importance has long since ceased to be that of regulating supply and become that of stimulating demand. Not manufacture, but selling, is the chief duty of the manufacturer today, and on this side New England seems to have been weak. New men will be found to understand modern conditions, and it will not be long before our textile mills will resume their place as consumers of power upon an increasing scale.

Attractions of Purchased Power

"The result will be that the market for electric power, which during the last few years has appeared to be saturated because it showed a rate of growth about equal to the rate of population increase, will increase at a normal rate—at least double that of recent years.

"The new men in the textile industry will not tie up their quick assets in power plants unless they are forced to do so. If power of reliable quality can be bought as cheaply as it can be produced they will buy and keep their money in quick assets where, by rapid turnover, it can be made most profitable. This means that there will be an opportunity for the central stations of New England to build up a much larger power load if they are alert and skillful merchants. Their major problem will be to ascertain, first, the prices at which the maximum volume of business can be obtained and, second, whether they can produce this quantity at a cost which will show a profit.

"The community has a right to demand that they exert themselves to the utmost to attain maximum volume, which means a low price, and in order to make any profit the highest possible efficiency in production is essential. But to reduce production costs much below their present level is not a simple problem; in fact, it seems improbable that the cost at the switchboard of steam-generated power at a given load factor can be reduced by any substantial amount from the figure now reached by the more efficient stations. So far as hydroelectric power is concerned, the same holds true, as the cheapest and best located sites have already been developed. Those that remain are either so far from the market that the transmission costs will be high or involve a high development cost, but a method is in sight which, if skillfully used, may enable the companies to make a substantial reduction in price without an undue sacrifice of profit. I refer to the possibilities of improving load factor by interconnection.

Combining Regional Power Resources

"If all the principal producing stations in New England are tied together by a well-designed transmission network and if their operation is co-ordinated with skill great improvement in the load factor and the capacity factor of the whole group can be made. This will reduce operating expenses by producing the power at the most efficient point in the system, taken as a whole, and will also reduce fixed charges, because the same total system load can be carried with a smaller investment in generating equipment.

"One good way to accomplish this result would be to combine all the operating units in New England by means of a holding company. There have always been too many small independent producers in New England for the good of the customers, and the area, population and market are not too large to be handled successfully by a single organization. The efforts of the New Eng-

land Power Association seem to look in this direction, and it is earnestly to be hoped that no narrow or selfish interest will be allowed to hamper this scheme of co-ordination. But it must be admitted that the provincialism of New England people and politicians is a somewhat serious obstacle in the road of progress in this direction. It is still illegal in Massachusetts to combine the operating companies of the state in the way which would be most useful to their customers, and the State of Maine is still inclined to prevent the development of its water powers by prohibiting the sale of the output in the only markets now available, which are outside the state.

Further Interconnection Would Help

"Fortunately so far as all the other New England States are concerned, there is a method by which the advantages of combination can be assured without sacrificing the independence of the present operating units. The objective is such co-ordination of all efficient generating stations that the diversity factor of all the loads in New England may be used to give the maximum system load factor, while at the same time the power is generated at the most economical point. This can be done by a well-designed transmission network centering on a load dispatcher who has complete control. Experiments with this method have already been made in the Connecticut Valley Power Exchange, through which the operation of the stations at Turners Falls, Springfield and Hartford have been profitably co-ordinated. Similar interchange arrangements have been employed by the New England Power Company.

"These, however, are only beginnings, and if important economies are to be achieved, the thing must go much further. The economy of quantity production in all industries depends upon a large and constant market. Demand determines supply. Big units of production and small or fickle markets cannot live together.

"The power market of New England, taken as a whole, is large enough to sustain large units of production, but broken up as it now is, such production is not profitable. Before really low production costs can be reached the whole New England market must be combined at some central point in the office of a load dispatcher, or, better, of a power broker, where all the power produced in the area will be bought and sold. Such a broker would act as the agent of all the producers, who would call on him daily or even hourly to know the prices and quantities of firm or secondary power which his clients had for sale. This market would be open not only to all the central stations but to those manufacturers for whom power was a by-product. Such an arrangement, operating like a wheat or cotton market, might introduce a form of competition into the electric power market which would keep the producers on their toes and prove to be a factor of major importance in the industrial development of New England."

Heating Engineers and Central-Station Sales Policy*

By B. M. Riker

Industrial Heating Engineer
Charles H. Tenney & Company, Boston

THE modern central-station heating engineer, in order to enter this field with any certainty of success, should be thoroughly trained in engineering fundamentals and be a salesman as well. He must be thoroughly familiar with the process under consideration, liberally endowed with an understanding of human nature and well schooled in the arts of tact and diplomacy. The successful application of electric heat will depend upon the engineer's ability to gain the confidence and the co-operation of the manufacturing executive and often of the operating superintendent through

**From the James H. McGraw prize paper, N.E.L.A., 1928.*

Extending Use of Dual-Purpose Lighting Standards

AMPLE illumination without glare is provided at this gasoline filling station and in the floodlighting of the building of the Jenkintown (Pa.) Bank & Trust Company by means of Golden Glow lantern floodlights of the Electric Service Supplies Company of Philadelphia. Ornamental street lantern and floodlighting projector equipment is combined. Two units mounted on a single standard are provided with 1,000-watt lamps.

his knowledge of their problems; to resist the temptation to criticise antiquated methods of heating in the shop, and to carry on and to complete negotiations in a manner that will fully satisfy the customer and create a welcome to the shop in the future.

The primary function of the heating engineer is to get the heating load upon the lines of the central station and to keep it there. Coincidently he has the opportunity to impress upon industrial customers the value of his service to them, and thus to improve customer relations. The first function is of course paramount and demands the formulation of a complete sales policy embodying:

1. *Analysis of the Heating Field.*—This may be accomplished by a thorough survey and should result in a tabulation of the details of all heating processes in the shop of every industrial customer.

2. *Formulation of an Active Sales Plan.*—This item should embody the setting up of advertising material, the organizing of the personnel of the heating division in a manner which will best fit conditions relating to the sales field and a policy of co-operation with the equipment manufacturers.

3. *Application of the Sales Plan.*—Coincident with the application of the sales plan, members of the heating division should be given every opportunity to familiarize themselves with new processes and equipment. Serial Report No. 278-13 of the Industrial Heating Committee of the Commercial National section, N.E.L.A., entitled "A Sales Plan for Developing the Industrial Electric Heating Load for Electric Service Companies," contains a store of helpful suggestions.

The sales policy of a combination gas and electric company should be largely determined by the individual requirements of each customer. Experience will usually show what form of heating medium may be relied upon to be most satisfactory for a specific application. In cases where the better method cannot easily be determined, or where the gas and electric heating engineers disagree, it is strongly recommended that the respective studies be judged by an impartial referee in the central-station organization, who through study or experience is qualified to act as a court of appeals. If this should fail to settle the matter, the studies should be combined in one comparative summary and submitted to the customer by *one* engineer. While there is no process to which electric heat cannot be applied (if it involves heating), there are a number of processes where electric heating may not be economical, and it should be constantly kept in mind that the future progress of electric heat depends upon satisfied users; hence the customers' interest must be held paramount.

Letters from Our Readers

Capacity Cost Allocation

To the Editor of the ELECTRICAL WORLD:

C. S. Reed, in his letter which appeared in the Sept. 22, 1928, issue of the ELECTRICAL WORLD used "$5 per kilowatt of plant demand" as representing the cost of one kilowatt of plant demand, and then declared unsound, illogical and dangerous certain allocation methods which, when applied to the assumed data, would allocate $5 per kilowatt to a 100 per cent load factor class. I can conceive of no other premise upon which Mr. Reed's arguments could be based than that $5 per kilowatt is in excess of the true cost for such service; consequently, if $5 is the true cost his premise is fallacious and his statements and conclusions must be declared unsound, illogical and dangerous.

If, on the other hand, the cost of a 100 per cent load factor class is less than $5 per kilowatt, the "peak responsibility method," the Greene-Schoonmaker-Gorton method (or Mr. Hill's similar method but independently developed), the Oram-Robinson "complete peak method" and the writer's "consumption and demand method" may be eliminated from further consideration, since each would allocate to a 100 per cent load factor class $5 per kilowatt. The Eisenmenger method and the "used and unused capacity method," where the unused capacity costs are allocated by the "demand method," may also be eliminated because both of these methods would allocate more than $5 to the 100 per cent load factor class.

The writer offers the following study in the hope that it may help a little in clearing up what appears to be a rather muddled affair. Assume a power plant with a plant demand of 9,500 kw. and operating at 50 per cent load factor with monthly capacity costs of $6 per kilowatt of plant demand. Now combine these two loads on one power plant with a plant demand of 19,000 kw., and assume the monthly capacity costs are reduced to $5 per kilowatt of plant demand. Designate the first load as Class A and the second load as Class B. Both contributed equally to the size requirements of the larger plant, which made possible lower unit capacity costs, and consequently both should benefit equally in the savings. It is inconceivable that Class B, just because it operates continuously at 100 per cent load factor and has no unused capacity to sell to others, should be entitled to more than 50 per cent of the savings, the only basis for a claim that Class B should be charged with less than $5 per kilowatt, and it certainly should not be entitled to less than 50 per cent, the only basis for a claim that Class B should be charged with more than $5 per kilowatt. If that reasoning is sound then the capacity cost per kilowatt of plant demand becomes the true unit cost of a 100 per cent load factor class. A common starting point will be had if this can be accepted as the true measure of the capacity costs of such a class.

The fact that Class A fails to use its plant demand continuously is evidently not a reason to relieve it of any part of the capacity costs created to provide for its maximum requirements unless and until its unused capacity or a portion thereof can be disposed of to some other class. It therefore appears evident that the capacity costs, in this example, should be allocated 50 per cent to each class, or at the rate of $5 per kilowatt of plant demand for Class A. If Class A's unused capacity can be disposed of only at a less amount than would be allocated to the purchaser by either the "Complete Peak Method" or the "Consumption and Demand Method," Class A's class should evidently be given the credit of the net amount for which its heretofore unused capacity may be sold. Capacity costs have not been increased or decreased by such disposition of this unused capacity. The disposition of unused capacity to controlled diversity classes may therefore become a matter of barter, with the amount charged for the capacity based on the value of the restricted use of the service. The writer objects to the "complete peak method" and to the "consumption and demand method" for application to conditions involving such disposition of otherwise unused capacity because such methods are too rigid and do not measure the capacity cost of such service. The writer has attempted, in his several articles and letters, to make it plain that the "consumption and demand method" was not intended for application to such conditions, but he has evidently failed to make the point clear to Mr. Reed and some other critics because they persist in wrongly applying the method and then blame the method instead of the person responsible for the presentation or the person responsible for the misapplication.

Iowa Railway & Light Company,
Cedar Rapids, Iowa.

W. J. GREENE,
Rate Engineer.

Digest of Electrical Literature

Transmission, Substations and Distribution

High-Speed Circuit Breakers.—T. W. McNairy.—High-speed circuit breakers have been successfully applied to direct-current railway systems for a number of years, but designs suitable for application on 12,000-volt, single-phase systems have not been made available until recently. A description of an air circuit breaker design suitable for a fixed service and having a speed of operation comparable with the direct-current type has been included in this discussion. The method of applying the magnetic type of mechanism previously used for direct-current breakers to the alternating-current type breaker has been described and the theory of the operation of the saturated transformer type of trip circuit used for this purpose has been included. It is stated that the use of this type of breaker on a 12,000-volt, single-phase system makes possible the same degree of protection and selective operation as is now being realized on direct-current systems.—*Journal of the American Institute of Electrical Engineers,* October, 1928.

The Behavior of Overhead Transmission Lines in High Winds. — E. H. Lamb.—An attempt has been made to formulate a theory of the swaying of one span of a single overhead transmission line due to the action of a transverse wind, on the assumption that the loop of wire swings as a rigid whole freely suspended at its extremities. The results include formulas for the calculation of equilibrium position of the loop in a steady wind, the maximum swing of the loop due to a short gust of known intensity, as well as the rate of decay of the disturbance, and the amount of continuous movement likely to be imparted to the loop by wind gusts of regular periodicity. Diagrams have been included to facilitate the estimation of these quantities and a few numerical examples are worked out for illustrative purposes. Suggestions for experimental investigation of swaying are made as a consequence of the form of the dynamical equations which occur in the theory. —*Journal of the Institution of Electrical Engineers (England),* October, 1928.

A Study of High-Voltage Flashovers. —Joseph T. Lusignan, Jr.—A discussion of the various forms of electrical discharges as they are characterized by the physicists. Oscillographic records of voltages and currents secured both before and during the flashovers are reproduced and discussed. Polarity tests are described in which the electrode shape and spacing were found to determine the sign of the half cycle at which flashovers would start. Photographic results obtained with moving films are illustrated showing the various stages of a flashover from the formation of the corona discharges through the initial sparkover to the development of the half-cycle arc channels. The flashovers studied ranged from several feet to 22 ft. in length. Spectrographic analyses of the different stages of a flashover are described wherein it is possible to gain some knowledge of several of the factors contributing to the conductivities of the various stages. Several of the spectra obtained are illustrated, along with a comparison spectrum of lighting.—*Report, American Institute of Electrical Engineers,* October, 1928.

Impulse Flashover of Insulators.—J. J. Torok and W. Ramberg.—The mechanism of insulator flashover is discussed by the authors in connection with a detailed consideration of the effect of various factors upon the flashover characteristics of insulator strings equipped with arcing rings. It is demonstrated that critical dimensions and spacings of arcing rings exist for a given insulator string. If the arcing rings are designed to lie on the safe side of the critical point cascading flashovers will not occur. If the arcing ring dimensions are below the critical value cascading may or may not occur depending upon the nature of the applied voltage wave. Data from tests which determined the limiting physical dimensions of arcing rings that will prevent cascading under all types of impressed voltages are presented in this discussion.—*Report of American Institute of Electrical Engineers,* October, 1928.

Hydro-Electric Development and Steam Equipment

Steam Tables and Equations.—H. L. Callendar.—Steam tables and equations published some years ago and representing the first thermodynamically consistent system devised for the tabulation of the properties of water and steam were based upon direct experimental measurements and involved several main features, namely, the adiabatic relation between the pressure and temperature for dry steam, the variations of the specific heat of water measured over the range of 32 deg. to 212 deg. F. by the continuous electric method, the specific heat of steam measured by a slight modification of the same method and in addition the application of the two laws of thermodynamics for the expression for the total heat of the vapor. The equation was obviously inconsistent with the universally accepted theory of the critical state and could not be extended to represent the phenomena in the critical region unless the existing theory could be disproved. The author has described the extension of the tables and equations to the limit of 4,000 lb. per square inch and 400 deg. C.—*Engineering (England),* Oct. 26, 1928.

Units, Measurements and Instruments

Theory of Transformer V-Connection.—M. Vidmar.—Three-phase transformers or transformer banks with one damaged phase can be operated with partial load in open V-connection as an emergency measure. In three-phase measurements two potential transformers may be V-connected to save a third unit. Comparatively little is said to be known about the theory of this old and much-used connection. It is the purpose of this article to establish the basis of a comprehensive theory of V-connected transformers. The author finds that for equal output, machines so connected are 20 per cent more costly and therefore not competitive, and that they cause unequal regulation even for symmetrical load. It is pointed out that double V-connection, that is, primary and secondary in V-, is considerably better, but rarely used, because the low voltage is usually Y-connected. The only practical use for double V-connection seems to be in three-phase measurements, for which reason the bulk of the article deals with this phase of the problem. *Elektrotechnik und Maschinenbau,* Oct. 21, 1928.

Impulse Characteristics of Driven Grounds.—H. M. Towne.—Studies of the impulse characteristics of several driven pipe grounds have recently been made utilizing the cathode ray oscillograph for recording the transient behavior. The author has described the apparatus used in the tests and as outlined in the results of his investigation. As a result it is concluded to be probable that for practically all classes of soil and all forms of electrodes the loop volt-ampere characteristic will exist. For lightning arresters of the pole type, 60-cycle ground resistance values of 15 ohms or less are desirable. Where such low values cannot be obtained a higher density of arresters per unit length of the line to diminish the net resistance from line to earth will, it is said, improve protection.—*General Electric Review,* November, 1928.

Illumination

Some Photoelectric and Glow-Discharge Devices and Their Applications to Industry.—J. V. Breisky and E. O. Erickson.—A report upon some of the intensive research work that has been carried out on photoelectric and glow-discharge devices during the past two years. The authors have devoted particular attention to the application of these devices in industry. Among the topics treated are the photoelectric cell, the photo-glow tube, selenium cells, the two electrode glow tube globe meter bulb, the grid-glow tube, the photo-glow tube, the photo cell amplifier unit, the multi-

cell circuit, color measurements and sorting, photoelectric smoke recorder and detector, electrostatic glow meter and the control of several industrial processes.—*Report of American Institute of Electrical Engineers*, October, 1928.

Electrophysics, Electrochemistry and Batteries

An Attempt to Detect a Magnetic Field as the Result of the Rotation of a Copper Sphere at High Speed.—W. F. G. SWANN and A. LONGACRE.—One type of magnetic field attributable to rotation is stated to be well known due to the investigation of previous research workers. This phenomena arises from the gyroscopic action of the rotation of the electron orbits of the atoms, which are responsible for the magnetic properties of the substance, and is zero when the intrinsic magnetic moment of the atom is zero. This is referred to as the Barnett effect. The present investigation is concerned, not with this effect, but with the possibility of the creation of a magnetic field as a result of causes of even more subtle nature, causes not included in the scheme of classical electrodynamics. It is stated that almost any theory of the origin of a magnetic field as the result of rotation of a neutral sphere makes the field depend upon the density of the material, the angular velocity, and the radius of the sphere. This research involves the inter-relation of the several factors. The methods of conducting the investigation, the data compiled as a result of the determination and the conclusions which the authors have considered to be justified are offered in this exposition.—*Journal of the Franklin Institute*, October, 1928.

Extinction of an Alternating-Current Arc.—J. SLEPIAN.—As the result of theoretical and experimental determinations the author has established certain conclusions regarding the extinction of an alternating-current arc. The transition from high conductivity to high resistivity which an alternating-current arc undergoes on extinction is studied and the theory and approximate calculations involved for the rate of recovery of dielectric strength of the arc space for short arcs as well as results of experiments with arcs in holes and in slots in insulating material and insulating plates have been included. The influence of chemical activity in arc gases is discussed and the factors contributing to the success of the alternating-current coil circuit breaker are suggested. *Journal of the American Institute of Electrical Engineers*, October, 1928.

Methods for the Derivation and Expansion of Formulas for the Mutual Inductance of Coaxial Circles and for the Inductance of Single-Layer Solenoids.—FREDERICK W. GROVER.—A classification of existing inductance formulas for the general cases indicated offers the basis for this article and a discussion of the possibility of additional formulas is introduced. The author has also developed a number of new formulas which it is said may be used to advantage for certain cases. Others which could be obtained have been discounted somewhat on account of complexity or poor convergence which impairs their potential usefulness. It is demonstrated by numerical examples that the inductance in any case can be calculated by more than one formula and to a degree or precision far beyond practical requirements.—*Bureau of Standards Journal of Research*, October, 1928.

Heat Applications and Material Handling

Charging-up of Particles in Electric Precipitators.—SETSUO FUKUDA.—As the result of theoretical determinations the author has concluded that in electric precipitation processes a small particle requires a charge dependent upon the time of charging for the given ion density but not upon field strength, while larger particles require a charge which increases with field strength and the time necessary for full charging is very small with usual current density. These theoretical conclusions have been confirmed by observing the space-charge effect caused by the charge of particles upon the discharge action of the precipitator; that is, the length of the precipitator and the velocity of the gas in it are selected for such characteristics as will protect the precipitating action of the charged particles during the passage through the equipment. The decrease of discharge current caused by the introduction of dust particles into the precipitator is measured for various discharge voltages, particle density, electrode size, and the time of charging. The results have been evaluated in connection with the consideration of the design of the precipitator equipment.—*Journal of the Institute of Electrical Engineers of Japan*, September, 1928.

Telegraphy, Telephony, Radio and Signals

Power-Line Carrier Telephony.—L. F. FULLER and W. A. TOLSON.—A brief outline of modern communication requirements in the field of power line carrier telephony and of the problems involved in providing this communication, together with a brief consideration of the different types of equipment now available for this purpose. It is stated that in general a carrier current channel can be made to accomplish what would otherwise require a separate pair of wires without the investment and maintenance charges involved in the latter. When the distances under consideration are sufficiently great these factors result in a monetary and operating advantage in favor of the carrier channel. New applications are said to be arising daily as evidenced by the case of a large pumping load supplied by one power system in a large territory.—*Journal of the Institute of Electrical Engineers*, October, 1928.

Methods of Measuring the Insulation of Telephone Lines at High Frequencies.—E. I. GREEN.—An outline of the problem of measuring the insulation of open wire telephone circuits in the frequency range of 3,000 to 50,000 cycles and a discussion of the method which has been utilized in the experimental study of insulator losses at these frequencies. A description of a special line which has been constructed for the testing of insulators and an explanation of the essentials of the measuring technique has been included, as has the brief summary of the results which have been obtained in this investigation.—*Peprint B-318 Bell Telephone Laboratories, Inc.*

Miscellaneous

X-Ray Tests on Impregnated Wood.—F. MOLL.—European and American investigators have advocated the detection of faults and measurement of the degree of impregnation in wood by means of an X-ray diagnosis. Systematic tests made by the author seem to indicate that such a method is impractical for two reasons. The cost and maintenance of the necessary powerful equipment are entirely out of proportion to the results gained, and, secondly, the diagnosis is absolutely unreliable, since no definite distinction can be made between the color density of the photographic negatives obtained from sections of wood, impregnated with $\frac{1}{4}$, $\frac{1}{2}$, 1 and 2 per cent of mercuric chloride solution. —*Elektrotechnische Zeitschrift*, Sept. 27, 1928.

Electric Applications in Municipalities.—A general survey of the various power and light requirements of medium and large size cities is covered in a number of short articles describing the applications in a general way and illustrating outstanding examples. Among these papers may be mentioned modern drives in gas plants, electric pumping stations, the growing use of electric welding, latest developments in street cleaning machinery, municipal refrigerating plants, flood lighting of buildings, lifting machinery for harbors, electrically driven public clocks, equipments of theaters, and many others. A symposium of this nature, which essays to give the reader a general impression of the subject, does not go into technical details, but conveys much valuable information by the study of the numerous well chosen illustrations.—*AEG Progress*, September and October, 1928.

Domestic Electrification.—A special issue of the *Electrical Review* has been devoted to the activities, both in England and in other parts of the world, in connection with the supply of electrical energy to home lighting and other domestic applications. A considerable quantity of information regarding Australia, Canada, New Zealand, South America and local conditions in Great Britain have been included. The status of a number of domestic appliances, their potentialities and the probable extent of their use have been covered.—*Electrical Review (Canada)*, Oct. 19, 1928.

News of the Industry

President Has Gist of Boulder Dam Report

Understood to Confirm Engineering Practicability of Structure in Colorado River, but to Cast Doubt on Economic Features—Would Cost $160,000,000

By Paul Wooton
Washington Correspondent for the Electrical World

ALTHOUGH no official information has been given out, as this is written, concerning the recommendations of the engineering board that has been investigating the Boulder Dam project, various members of Congress have been allowed to see a summary which has been submitted for the guidance of the President in the preparation of his annual report to Congress. The indications from their discussions are that the board believes it is feasible to construct a high dam at the proposed site. Apparently, however, the board is convinced that more than $160,000,000 will be required for the project. A part of this covers changes in the structure suggested by the board. The board is understood to feel little assurance that the returns from the sale of power will pay for the project even if the cost of the all-American canal be eliminated. In that connection, however, proponents of the bill contend they always have expected those directly benefited to pay for the canal. It is suggested also that at least a portion of the cost of flood control could not be met from power revenues.

It is recognized that passage of the bill, which now seems certain, does not mean necessarily that an early start on construction will be possible, as injunctions doubtless will be sought on constitutional grounds.

In view of the fact that the board apparently is not satisfied with some of the economic phases of the undertaking, some of the opponents of the bill are suggesting that time be given to it to study further those phases of the plan before the bill is taken up. The law creating the board gives it a continuing status. Those supporting the project point out that the bill provides for an engineering review, which in its economic phases could be made by this board after the passage of the law.

Opponents of the measure take the position that the report of the engineering board changes the entire picture. Heretofore the project has been recommended as a self-supporting one. Now it is pointed out that instead of being the burden bearer power will have all it can do to pay its own way. This, they argue, reduces it to a power proposition rather than a project in which power is the incident. The opposition contends that the board really has found that the project is not feasible and simply has suggested engineering changes which make it feasible. On the economic side the report is held to be as unfavorable as any of the opponents could wish. It also is said to be certain that the bill will have to be changed as to the requirement that contracts for the power adequate to return the cost to the project must be in hand before construction work is begun.

Senator Johnson of California, on his return to Washington, asserted that the report seems to indorse the feasibility of the project and confirms the site which has been the subject of so many attacks. The changes suggested by the engineering board, he said, are not insurmountable obstacles. He declared that he would be unyielding in his determination to keep the bill before the Senate until it shall have been disposed of.

Dern of Utah Addresses Other Governors on Boulder Dam

An earnest plea that the Boulder Dam project be held up until the water rights of all the states involved have been fully guaranteed was made by Governor George H. Dern of Utah at the Conference of Governors held at New Orleans Nov. 20-23. Governor Dern declared that if the Swing-Johnson bill is enacted, it will be a clear case of the federal government overriding the sovereign rights of six states as a piece of favoritism to one—California.

"The country has been led to believe that the Boulder Dam controversy is a power fight," declared the Governor. "So far as Utah, Colorado, Wyoming and New Mexico are concerned, it is not a power fight, but a water fight. The Boulder Dam is essentially a California enterprise, and yet no part of the Boulder Canyon project is located in California. It is wholly within the States of Arizona and Nevada. To construct the project over the protest of these states amounts to an invasion of their territory and a violation of their sovereignty through the instrumentality of the federal government. It has been argued that the passage of the Swing-Johnson bill will be a good thing for the upper basin states because it will impress the terms of the Colorado River compact upon the river and place the repsonsibility for its enforcement upon the United States and hence any power license granted by the Federal Power Commission will thenceforth be subject to the compact and cannot establish any undue priorities against the upper states. If the compact were made wholly effective by seven state ratifications, this would be a strong argument. Congress, however, has temporarily taken the Colorado River out of the control of the Federal Power Commission, for the express reason that any power project constructed in advance of the approval of the compact might set up priorities against the upper states.

"It is true that, on account of the unyielding and uncompromising insistence of Arizona and California upon their own respective points of view, prompt settlement has not been reached by interstate negotiation. However, what is a delay of six years in the lifetime of a nation?"

Upper Colorado Basin Executives Agree on Policy

Three of the four governors of the states in the Upper Colorado River basin have personally or through a representative agreed to sign a communication addressed to every senator and representative in Congress setting forth the attitude of the upper basin toward pending river development legislation. Governor Adams of Colorado and Governor Emerson of Wyoming said that the views set forth in the letter had their approval, and Francis C. Wilson, interstate water commissioner for New Mexico, declared he had no doubt that Governor Dillon of that state will sign it. Governor Dern of Utah had not been canvassed at the time of this writing, he being out of his state. The amendments asked to the bill would limit the amount of water which California would be allowed to take from the river, in the absence of an agreement between the seven states, and would curtail power development by Arizona.

Kentucky Legislators Begin Utility Investigation

Under a resolution passed this year by the Legislature of Kentucky, a committee composed of senators and headed by Lieut.-Governor James Breathitt, Jr., appointed to investigate public utilities of every kind, met at Louisville on Saturday, Nov. 24, for its first session.

Mr. Breathitt, explaining that the committee has no predetermined recommendations to make and does not yet know whether the present laws need change, outlined three general heads under which it will operate—invest-

ments in public utilities, franchises and rate regulation, and taxation. He stressed the point that the members of the body were entering into their task with open minds and that there was "no spirit of antagonism on the part of the committee toward that it is expected to investigate." He pointed out that there is no state body regulating utilities in Kentucky and that companies are subject to regulations on the part of each county in which they do business.

L. B. Herrington, president of the Kentucky Utilities Company, outlined the holdings of his company in Kentucky and advised the committee that the company stood ready to co-operate. T. Bert Wilson, general manager of the Louisville Gas & Electric Company, and other public utility officials made similar pledges.

Bill to Make Radio Broadcasting Stations Utilities

Radio broadcasting stations will be classified as public utilities and subjected to regulations as such, if a bill which Representative George Huddleston of Alabama intends to introduce early in the December session of Congress be passed. By the terms of this measure the Federal Radio Commission would be made a permanent body and would be charged with the enforcement of the regulatory provisions, with direction from Congress to regulate practices and charges by the broadcasters and to prevent discrimination.

Commenting, on his proposed bill Mr. Huddleston said:

"Enormous power is held by the broadcasting stations, which, if they choose to do so, could practice extortion or discriminate in various ways harmful to the public interest. Extensive use of the radio in the recent political campaign illustrated its enormous quality as a molder of public opinion and showed that this means of communication has entirely too much power to remain unregulated. With large stations possessing exclusive use of wave lengths, the growing method of chain hook-ups means that a political party, or any business or individual with sufficient money, can get a message to all parts of the country on all wave lengths and virtually exclude during the time allotted any other word by the air. It is also important that rates for use on the radio be uniform to all who engage time on the air."

Projects for Lewis, Gasconade and Rockcastle Rivers

The Inland Power & Light Company of Portland, Ore., has applied to the Federal Power Commission for a preliminary permit covering a 233,000-hp. project on Lewis River near Vancouver, Wash. The plan is to develop the power resources of the stream progressively. At the Ariel site, 17 miles above the confluence of the Lewis and Columbia Rivers, it is proposed to construct a dam 200 ft. high. At a point 32 miles from the mouth of the Lewis River, at the Basket site, it is planned to erect a dam 230 ft. high. Thirteen miles further up the river, at the Swift site, another 200-ft. dam is projected, along with a five-mile tunnel. At the Muddy Creek site, 12 miles above the Swift site, it is proposed to erect a 150-ft. dam and to construct a three-mile tunnel. The applicant is closely associated with the companies serving the Portland area and with the Washington Irrigation & Development Company, which holds a license for the development of the large project at Priest Rapids. Under the terms of that license work must begin not later than March 1.

The Gasconade River Power Company of Kansas City has applied for a preliminary permit covering a project on the Gasconade River near Rolla, Mo. It is proposed to construct a dam which will furnish a head of 90 ft. and create a reservoir of 400,000 acre-feet capacity. Some 6,000 hp. of primary power will be available, it is estimated. The applicant plans to develop this site in connection with a project on the lower part of the Gasconade River covered by a preliminary permit issued the company on Aug. 21 of this year.

John A. Shafer of Indianapolis has applied for a preliminary permit covering a project on Rockcastle River in Pulaski County, Ky. He proposes to construct a dam 250 ft. high which will create a reservoir having 40 square miles of area. It is planned to install 36,000 kw. This application conflicts with one previously submitted by L. E. Bryant.

The Mountain States Power Company of Albany, Ore., has applied for a license covering a transmission line 66 miles long to connect Lovell and Worland, in Wyoming.

Union Carbide Official Talks of New River Plans

Confident belief that the Public Service Commission of West Virginia will grant a permit for the construction of the two proposed power dams at Hawk's Nest, on the New River, to the New-Kanawha Power Company, a subsidiary of the Union Carbide & Carbon Corporation of New York, just as soon as the necessary details can be worked out, means, representatives of the company say, that many millions are likely to be invested in manufacturing plants in the Kanawha Valley. The New-Kanawha Power Company alone will expend between $7,000,000 and $9,000,000 for its power project, according to a statement made by Louis N. Davis, an officer of the New-Kanawha company and executive vice-president of the Union Carbide & Carbon Corporation.

The conflicting petition of the Virginia Hydro-Electric Company of Charlottesville, Va., subsidiary of the Virginia Public Service Company, for permission to construct a dam at Sandstone Falls on the New River (ELECTRICAL WORLD, Nov. 3, page 910) has not yet been heard.

Bay State Utilities Oppose Regulative Legislation

John H. Fahey Advocates Financial Regulation Where Funds Borrowed Exceed $50,000—*S. E. Wardwell Minimizes Valuation Discrepancies*

IN ACCORD with a resolve of the last Legislature, the Massachusetts Department of Public Utilities recently gave a public hearing upon the status of gas and electric company regulation in the Bay State, with a view toward formulating a report on this subject at the January session of the General Court. Last winter, as the ELECTRICAL WORLD reported at the time, the commission advocated a bill providing for regulation by contract with the state, but action upon this was deferred for a year. Considerable opposition developed among the operating companies and in business circles, to the mandatory features of the bill, and especially to a provision which appeared to take away from signatory parties the right to court appeal in case of aggrievement. This postponement, combined with active court proceedings in the Worcester and Cambridge rate cases, created much interest in the recent hearing, at which strengthening the commission's jurisdiction was prominent as an object.

John H. Fahey, publisher of the Worcester *Evening Post*, urged a relaxation of the laws under which municipalities may undertake to enter the business of gas and electricity supply. He declared that he preferred private operation of utilities if efficient service at fair prices is thereby made available. Chairman Attwill pointed out that recent legislation places intercompany contracts exceeding three years' term in the jurisdiction of the commission, and Mr. Fahey stressed the importance of avoiding discrimination in power rates to small industrial customers, contending that in Massachusetts 80 per cent of all industries employ less than 500 men each and that more than 50 per cent employ only 100 to 250. Relative to financial regulation, the speaker said that in his opinion the commission should have authority to supervise the borrowing of funds in excess of a minimum of about $50,000, and he asserted that in some instances holding companies are lending money to subsidiaries at rates above the market. Mr. Fahey advocated a more general use of bond financing by Massachusetts gas and electric companies, maintaining that at present too large a percentage of capital is issued in the form of stock. He suggested the issue of management stock to executives and employees as a means of rewarding able administration.

Sheldon E. Wardwell, for the Massachusetts Gas and Electric Association, pointed out that there were 90 rate reductions last year by gas and electric companies in Massachusetts, most of these being voluntary. With the exception of the Worcester Electric Light case, every reduction ordered by the commission is in effect. The Cambridge

Electric Light Company is testing the commission's decision in the courts, as is Worcester. In the Worcester case a difference of only 1 cent per kilowatt-hour separates the disputants. Forty years of regulation, the speaker declared, have shown that the reasons advanced for further legislation at this time are ephemeral rather than real. He averred that the difference between a rate base predicated on reproduction cost less depreciation and one fixed upon investment is fast disappearing with the expansion of the utilities and that a regulative contract would be of doubtful flexibility under conditions prevailing or likely to exist in the state. Safeguarding the investor against the easy entrance of municipalities into competition with private companies he held to be essential to attract capital freely into the public service field.

Hear Plea for Uniform Regulation

Henry R. Hayes Explains Its Desirability to Public Utilities Association of Virginia at Roanoke Meeting—An Appeal for "Honest Revealment"

THREE hundred persons from nearly all parts of Virginia were in attendance on Wednesday, Nov. 21, at the opening of the annual meeting of the Public Utilities Association of Virginia, at Roanoke, when President J. W. Hancock of that city rapped for order. Another hundred registered later. Sessions continued through Thursday, on which day the business session closed at noon and the afternoon was given over to recreation.

William Meade Fletcher, a member of the Virginia State Corporation Commission, was the first speaker, his subject being "The Relation Between the Public Utility and the Public." After giving a condensed history of the different utility services that have come to play so important a rôle in daily life, Judge Fletcher adverted to the constant need for good service from the companies if agitation for public ownership is to be kept out.

"The public utility," he said, "should have the same right as any one else to place before its patrons the facts in connection with its industry, and it should have the same right to publish its articles in newspapers and magazines as has any other interest, and should have the same right to correct false and misleading statements and to protect itself from an unjust attack as is granted to others. Instead of the policy of concealment, there should be the policy of honest revealment, and when this course is pursued honestly, fairly and with no misleading propaganda, no distortion of facts, no concealments or evasions, and the public is fully taken into the confidence of the utility and made to understand the nature of its business, the cost of conducting it, the effect of restrictions placed upon it, the part it plays in the life of the community and its needs and necessities, and the public is made to realize that the utility is in every sense a public utility, then the public utility has gone far to establish better relations between it and the public, and the way has been paved for a sympathetic attitude on the part of the public to its necessary requirements."

A plea for the adoption of uniform public utility legislation in the various states was made by Henry R. Hayes, vice-president Stone & Webster and Blodget, New York, whose address was entitled "Some Investment Banking Views of the Public Utility Industry." This uniformity, the speaker said, is especially needed in view of the interconnection of power systems and the need for funds with which to finance expansion. Operating companies could command a freer flow of money if the Southeastern States would adopt the indeterminate permit or franchise as set forth in the proposed uniform public utilities act.

"I know of no way," Mr. Hayes concluded, "to have a thorough appreciation of the facts other than by a full disclosure of financial information of operating companies. That can take place only when commissioners have broad powers as contemplated under the uniform public utilities act. Under that act commissioners would have authority to make full investigations and publish their findings. There is nothing new about this thought. It does, however, seem to me essential to emphasize this and to urge the further need of creating commissions in states which do not have them and to see to it that all commissions have broad authority. Above all, it is absolutely requisite that legislatures be sufficiently liberal to the end that state commissions shall not be cramped for lack of funds."

William E. Carson, chairman of the State Conservation and Development Commission, described the functions of that body, and J. L. McCoy of the Westinghouse Electric & Manufacturing Company gave a demonstration of "Televox," after which group luncheons of the various sections of the association were held.

In the afternoon Tom P. Walker, vice-president Virginia Electric & Power Company, talked on urban transportation problems; J. P. Fishburn, president Virginia State Chamber of Commerce, on industrial development in that state, and Colvin Brown of the United States Chamber of Commerce on "Your City and Your Business." Two papers of more immediate interest to the electric light and power industry were the one on a fundamental rate base by Vice-President N. M. Argabrite of the American Gas & Electric Company and that of D. H. Barger, former president of the Farm Bureau Federation, on extension of electricity to the farm. The latter was followed by a "farm demonstration" by the Virginia Electric & Power Company. While this session was being held the women delegates had a parallel meeting.

An attendance of 350 persons marked the dinner on Wednesday night at the Hotel Roanoke. Colonel J. P. Woods of Roanoke acted as toastmaster, and Mr. Fishburn was the chief speaker.

On Thursday morning Alexander Forward, managing director American Gas Association, spoke on "Whither Public Utilities?" Committee reports followed. Officers elected for the ensuing year were: President, A. W. Higgins, executive vice-president Virginia Public Service Company; vice-presidents, C. B. Short, manager Roanoke Railway & Electric Company, Roanoke; T. Justin Moore, vice-president and general manager Virginia Electric & Power Company, Richmond, and Herbert Markel, division manager Appalachian Electric Power Company, Bluefield, Va.; secretary (re-elected), Allyn B. Tunis, Richmond; treasurer, Arthur H. Herrmann, Richmond. It was decided that future conventions of the association should be held in the early part instead of the latter part of the calendar year.

A.E.C. Advocates a National Hydraulic Laboratory

The American Engineering Council has, its president, A. W. Berresford, has just announced, "recommended indorsement of the principle of a provision for the expenditure of federal funds on public works already authorized to increase employment in time of extraordinary depression of private industry, provided such expenditure can be carried through without any increase of taxation." The council urges also the establishment of a national hydraulic laboratory in the United States Bureau of Standards, an inventory of the water resources of the United States, the transfer to the Department of the Interior of the public works functions of the federal government, topographic mapping to aid in the solution of flood problems of the Mississippi River, and uniform requirements affecting government contracts. In advocating a hydraulic laboratory the council voices the conviction that research carried on by the federal government should be so fundamental that it cannot properly be attacked by private industries. Otherwise, it is the opinion, overlapping of functions and bureaucracy will result.

The American Engineering Council, President Berresford says, after recounting its viewpoints affecting Mississippi flood control and other engineering matters, plans to increase the public service activities of engineers during 1929. A program will be mapped out at the annual assembly of the council, which has been summoned to meet in Washington on Jan. 14 and 15.

McGraw-Hill Expansion

Industrial Publishing Company Will Have Its Own Building in Chicago and a Resident Vice-President There

TO KEEP step with the rapid development of its business, the McGraw-Hill Publishing Company, Inc., publisher of the ELECTRICAL WORLD, is erecting in Chicago a building to bear its name and for the first time is placing there a resident vice-president as head of its Chicago interests. The building will be at 520 North Michigan Avenue, two blocks north of the Wrigley Building, in a rapidly developing new business center, and will house all the McGraw-Hill interests centering in Chicago. The resident vice-president will be Edward J. Mehren, a native Chicagoan, who has been with the McGraw-Hill organization in New York for 22 years in editorial and publishing capacities.

These developments have long been planned by the company. For 25 years it has maintained in Chicago large editorial, sales and circulation staffs, in intimate contact with those who have been making engineering and industrial history in that territory. This intimacy has impressed on the organization the great engineering and industrial strides of the Middle West and its still greater potentialities. The company now publishes four papers in Chicago, the *Magazine of Business, Factory and Industrial Management, System* and the *Harvard Business Review,* the last named published for the Harvard University School of Business Administration. A fifth magazine, *Industrial Engineering,* will be transferred from New York to Chicago in the near future. There are now more than four hundred employees in and attached to the Chicago office.

Edward J. Mehren, the resident vice-president, was educated at the University of Illinois. After a short period of service in the civil engineering corps of the Burlington and St. Paul railroads, he became associate editor of *Engineering Record* and then, in succession, editor of that paper, editor of *Engineering News-Record,* vice-president in charge of publication of four of the company's magazines and, finally, vice-president and editorial director in charge of editorial work of all its properties. Recently he was appointed editor of the *Magazine of Business,* and he will continue that responsibility in addition to his duties as resident vice-president.

James H. McGraw, chairman of the board of the company, made the following comments on these developments: "The publishing interests of the country have long been aware of the advantages of location near the center of population and industry. These have been advancing steadily westward. The inevitable conclusion is that a house of national interests, particularly when it has a number of papers, should strengthen its position by decentralizing its operations. This is another forward step in the steady growth of the McGraw-Hill organization as an effective institution for serving American industry and business. It marks the realization of my hope of many years that the company should have a strong publishing house in the Middle West, at a second major radiating point, giving practical expression through the various channels of its activities of the service opportunities and ideals of the McGraw-Hill Publishing Company. The organization has always been international and national in thought and purpose. Now it gives a new physical expression to its aspirations and to the policies expressed in its papers."

McGraw-Hill's coming Chicago building

Purchases and Mergers

Formal petition has been made to the New York Public Service Commission by the Rochester Central Power Corporation for permission to acquire the outstanding common stock of the Lake Ontario Power Corporation in exchange for stock of the petitioner, the total consideration being $1,005,000. The Lake Ontario Power Corporation serves Lyons, Macedon, Newark, Palmyra, Red Creek, Savannah, Sodus, Wolcott and centain towns in Wayne, Cayuga and Monroe Counties. A hearing was held by the same commission on Monday on the application for the merger with the New York State Electric Corporation of the Eastern New York Electric & Gas Company, the latter itself embracing about twenty former operating concerns, among them the Plattsburg Gas & Electric Corporation, the Harlem Valley Electric Corporation and the Northern Adirondack Power Company. Both the above proposals have been noted before in the ELECTRICAL WORLD.

Stockholders of the Penn-Ohio Edison Company, the Penn-Ohio Securities Corporation and the Northern Ohio Power Company have approved the proposal to merge the three companies.

An offer from the Illinois Power & Light Corporation to purchase the Princeton (Ill.) municipal electric plant, as well as a previous offer from the same company to lease it for five years, were rejected by the City Council, a petition against acceptance having been signed by twelve hundred citizens. The city met the company's proposed schedule.

The Nebraska Electric Power Company of Scottsbluff has purchased the property of the Blue Creek Lighting & Power Company, which includes the town of Lewellen and outlying lines.

Cities Grow as Do Light and Power, Arkwright Says

How an electric light and power company in any town or city is linked with the development of the community, is vital to its growth and becomes a permanent resident of the community was brought out by Preston S. Arkwright, president of the National Electric Light Association, when he spoke before the regular weekly luncheon meeting of the Chicago Association of Commerce in the Hotel La Salle recently on the subject "Community Development and the Electric Light and Power Company." Bernard J. Mullaney presided at the luncheon, and many prominent utility men were present, including Samuel Insull, L. A. Ferguson, W. W. Freeman, E. M. Herr and George N. Tidd. Mr. Arkwright said in part:

From a purely selfish standpoint there is and there can be no institution in any community more vitally interested in the growth and prosperity of that community than the electric light and power company. It renders a useful business service, underlying the business of every other enterprise in the community. In addition to that it devotes its energies, its resources, from a purely selfish standpoint, each company devoting all it has of resources and brains and effort and energy to the building up of the particular community that it serves. . . .

In all of the states and in all of the communities everywhere you will find the electric light and power companies actively, enthusiastically and interestedly supporting the various chambers of commerce and trade bodies. You will find them everywhere supporting all these institutions for the civic development of the community where their business is located. In many places these companies maintain departments of their own for building up those communities and those states industrially. They advertise in national magazines. They maintain industrial agents. They do everything within their power to build up industrially and otherwise the various local communities. . . .

You have here in Chicago about the largest percentage of domestic use of electrical energy of any city in the world. It happens that in Chicago there never has been an increase in the cost of electric service in the whole 48 years since it was first established. I do not know of any other business enterprise that has that record. This industry works no magic. It has to submit to increased cost of material, labor and taxes in its business, but by improvements in its machinery, by adoption of improved methods and management it has been able to overcome the increase in the cost of material and labor and reduce the cost of its product to the public.

We feel that our business will be understood and will be safe in the hands of business men. In the development of the business we have to overcome natural obstacles. What an infinite pity it would be if artificial obstacles should be permitted to retard its progress!

Bituminous Coal Problems Further Canvassed

International Conference at Pittsburgh Hears View of Chemical Engineer on Processing—Many Important Points Affecting Combustion in Power Plants

CONCLUDING sessions of the International Conference on Bituminous Coal held at Pittsburgh last week, and of which the first three days' proceedings were reported in the ELECTRICAL WORLD for Nov. 24 (page 1059), maintained the interest aroused by this large gathering of experts from twenty nations.

In discussing the chemical engineering view of coal processing on Thursday, H. C. Parmelee, editorial director *Chemical and Metallurgical Engineering*, indicated that "one may with considerable justification forecast the time at which coal as a raw material will be as important as coal used for heat and power." He added: "Quite lately the chemical engineer has been giving thought to some rather unorthodox ideas of coal as a source of power. The chemical engineer is today probably almost ready to assure the mechanical engineer that he will furnish a boiler medium affording not less than 40 and probably nearly 50 per cent efficiency even when operating within the present pressure and temperature limits." The possibilities of diphenyl, rather than mercury, were emphasized by Dr. Parmelee.

Prof. A. G. Christie of Johns Hopkins University reviewed some features of modern furnaces burning bituminous coal under their boilers and outlined probable future trends in which the elements of improved refractories with catalytic action, slag screens, water-cooled furnace walls, preheated air, improved stokers with pulverized-fuel equipment and automatic combustion control would play a major part. Professor Christie foresaw the difficulties with ash lessened by better raw-coal preparation at the mines so that less ash will have to be removed at the plant.

A. R. Smith of the General Electric Company spoke on "The Kilowatt-Hour and the Thermal Economy of Its Production" and discounted the retarding effect upon hydro-electric development of further progress in steam generating stations, saying: "The hydro-electric plant is going to remain an important factor in electric power production. The more expensive developments may be delayed because of advances by the steam plant, but the hydro-electric plant has some indisputable qualifications which are assets to the owner and to the nation." Fuel and steam cycles and their possibilities for improvement were considered by Mr. Smith, who also presented information regarding a study undertaken by his organization for a combination gas and steam plant based on the complete gasification of coal in large single retorts to be operated at moderate temperatures and using a moderate amount of steam in the process. This investigation was undertaken for the purpose of getting some conception of the possibilities of reducing electric power production costs.

W. D. Langtry and J. H. Kohout in a joint paper discussed the effect of the fusing point of ash on mixtures of coal and foreign materials, and F. R. Wadleigh of the Consolidated Gas Company considered the reasons for the need of clean coal from the standpoint of the power and light industries, emphasizing economic aspects of the situation and offering data regarding practical economies in the transportation and use of clean coal. Mr. Wadleigh recognized the increased cost of coal preparation as a serious element in the discussion, but indicated that an economic balance could be struck.

The question of how carbonized fuel produced as a result of precarbonizing processes could be burned was discussed by M. Alpern, president of the American Engineering Company, in connection with an exposition of experimental data on by-products plants.

Among the papers presented on Friday was one on potential relations between electricity and coal utilization by A. T. Stuart of Canada, who concluded that solid fuels may largely disappear from the market and that demands will be almost exclusively for gaseous and readily gasifiable liquid fuels. He foresaw future developments as involving tremendous plants for the electrolytic decomposition of water in order to secure the necessary hydrogen for satisfactory gas fuels, the production of which would otherwise involve large losses. "In fact, it is not unlikely that more water than coal will be used as raw material and that perhaps half of the energy of future fuel will come from the combustion of hydrogen obtained originally from water," he said. The relationship of such developments to the attainment of higher generating-station load factors was stressed by Mr. Stuart.

J. E. Noeggerath of Germany spoke on the closely related topic of high-pressure electrolysis and its influence on power and fuel, outlining a method which eliminated the need for a compressor plant for the handling of the hydrogen and oxygen.

Many other notable scientists and men of industry contributed to this all-week consideration of the many problems and possibilities of bituminous coal and its utilization. Among the chairmen of the sectional meetings were J. D. A. Morrow, George A. Orrok, Samuel Insull, H. E. Howe, Charles L. Parsons, Frank B. Jewett, John M. Carmody, Charles H. Herty, Calvin W. Rice, George H. Ashley, Fred R. Low, W. H. Fulweiler, S. A. Taylor and Charles L. Reese.

Interconnecting Ring Planned for Upper New York

Initial steps in construction of a million-dollar interconnecting system designed to link the chief western New York utilities in a single ring for interchange of power have been set in motion at two points up the state. Construction of a new 110-kv. line from Elmira to Geneva was begun under direction of the Elmira Water, Light & Railroad Company, and plans for rebuilding lines from Rochester to Geneva and constructing a new link from Rochester to Perry were perfected at a meeting of the board of directors of the Rochester Gas & Electric Corporation. When the new lines are built they will make possible the exchange of power from three sources—the Niagara network, the proposed hydro plant of the Rochester utility in the Genesee River at Mount Morris, and the Lake Lamoka project now under construction at Keuka Landing by the Mills brothers of Sodus, where water will be utilized twice in successive falls from separate levels. The two projects last mentioned have been described in the ELECTRICAL WORLD more than once.

The Elmira company will bear the construction expense of the Elmira-Geneva power line as far as Watkins Glen and the Empire Gas & Electric Company of Geneva will continue it from Watkins Glen to Geneva, the line cutting through new territory. The Rochester-Perry interconnection will be tied in with the existing line between Perry and Elmira, bringing the New York Central Electric Corporation into the combination.

Conflicting Views on Imperial Valley Power Plans

Unless the Imperial Irrigation District in the Imperial Valley of California is able to divert more than 74 per cent of the valley's power load from the Southern Sierras Power Company, which is now taking care of the district's electric needs, the plan to spend $2,100,000 for the development of hydro-electric power in the canal system of the district will not be a paying investment, according to the opinion of A. Kempkey, consulting engineer of San Francisco. Mr. Kempkey's report on the feasibility of the Imperial power proposal was made at the request of State Engineer Hyatt and was made public by C. W. Brockman, director of the Imperial Irrigation District.

The San Francisco engineer estimates that the cost of the five proposed hydro power plants and one steam unit would be $2,390,700, which is $290,700 higher than the estimate of the State Engineer's office and $690,700 in excess of the figures of M. J. Dowd, engineer for the Imperial Irrigation District, who recommended the project. By Mr. Dowd's plan the district would take advantage of small drops in the canal system to install a series of five hydro-electric units, developing from 300 kw. to 1,300 kw. each, and would also build a steam plant at the city of Imperial. The total power developed from the hydro units is estimated at 3,000 kw. and that from the steam plant at 5,000 kw., and Mr. Dowd asserted that the district could sell its power 30 per cent lower than the rates now charged by the Southern Sierras company and earn 11.7 per cent on the investment.

Although the State Bond Certification Commission, after a year's delay, finally gave its approval early last month to the calling of a bond election, serious opposition has developed among valley property owners. This opposition is believed to have been responsible for the announcement made by the district directors two weeks ago that they would postpone the date of the election to early next summer.

Electrification of Cleveland Terminal Zone

Announcement of the plans of the New York Central Railroad system regarding its part in the electrification of the new Union Station now under construction in Cleveland has been made as follows:

After Jan. 1 all New York Central passenger trains in and out of Cleveland will be handled by electric locomotives. The electrified zone is to include about 16 miles of multiple-track route, extending from Linndale in the west through the new terminal station to Collinwood on the east. A portion of this electric zone will be on the right-of-way of the New York Central and the Big Four lines and the remainder on the Nickel Plate.

The power distribution will be of 3,000 volts direct current, with catenary overhead construction. The motive power for the initial operation will include at least twenty 204-ton geared-type passenger locomotives. These locomotives are being built jointly by the American Locomotive Company and the General Electric Company. They will have ample capacity for handling Pullman trains weighing as much as 1,275 tons trailing. Each unit will weigh 204 tons, with 150 tons on the drive axles. The six geared driving motors will have a total rating of 2,900 hp. at the one-hour rating and 2,465 hp. at the continuous rating. Current at 1,500 volts will be supplied by a 3,000/1,500-volt dynamotor for driving the blowers and some other auxiliary circuits. Low-voltage power for control, light, &c., will be taken from a control generator mounted on an extension of the dynamotor shaft.

Public Utility Commission for British Columbia?

It is estimated that the program of electrical development under way or about to be started in the Province of British Columbia will add nearly 50 per cent to its total electrical output in the next two years and will cost more than $10,000,000. This development has increased agitation for controlling the production of power by legislative action under a public utility commission, and the question of establishing one will be an important issue before the Provincial Legislature at its next session.

Altogether 218,500 hp. will be added to the electrical supply of the province, which now totals 480,000 hp. There are three major projects and a series of smaller ones. The great Bridge River plant of the British Columbia Power Corporation will produce 60,000 hp. when the plant is opened and will be gradually extended to 300,000 hp. At South Slocan the West Kootenay Power & Light Company is about to throw in the switch on a development of 60,000 hp., and on the Pend Oreille River the same company is ready to go ahead with a plant which will turn out 80,000 hp. at a cost of approximately $4,000,000. East of Elk River, the East Kootenay Power Company will proceed immediately with the construction of a plant to turn out 15,000 hp. to supply consumers as far east as the Alberta side of the Crow's Nest Pass.

In addition to these bigger developments, the British Columbia Electric Railway Company is adding 2,000 hp. to its Jordan River plant outside Victoria, while 1,500 hp. will be developed by the West Canadian Hydro-Electric Corporation at its new plant on the Shuswap River for consumption in the Okanagan Valley and surrounding districts. These projects are distinct from the construction of pulp mills at Prince George, Campbell River and the Nimpkish River, all of which will develop power on a large scale for their own operations.

Briefer News

ALABAMA POWER COMPANY TO BUILD STEAM PLANT AT MOBILE.—The Alabama Power Company has announced plans for the erection of a steam-power plant at Mobile, the estimated cost of the initial unit of which is placed at approximately $1,300,000. This plant will be built to supply power for operating a large paper mill of the International Paper Company now under construction at Mobile. The first unit will be ready for operation in eight or nine months and will be rated at 7,500 kw. The Southeastern Production Company has been formed to undertake its construction. Tentative plans call for completion of the unit by October, 1929. It will be built on Hog Bayou, a tributary of the Chickasabogue, adjacent to the site on which the mill is being built.

NORTHWESTERN ELECTRIC COMPANY WILL ENLARGE PORTLAND PLANT.—The capacity of the Northwestern Electric Company's Lincoln Street steam plant in Portland, Ore., is to be enlarged from 20,000 kw. to 40,000 kw., at a cost of about $1,200,000, and work will be started immediately, according to Guy W. Talbot, president of the company.

SURPLUS POWER AT GUERNSEY, WYO., TO BE USED FOR IRRIGATION. — The Nebraska Electric Power Company of Scottsbluff, which has a contract to purchase power from the government dam at Guernsey, Wyo., has made surveys of territory outside the districts irrigated by the federal project and as a result will construct a number of transmission lines which will supply energy to pump water for several thousand acres that can be brought under cultivation only in this way. Two units will be installed near Ogallala and two south of Bridgeport.

RURAL LINES IN ONTARIO INCREASE 955 MILES SINCE JANUARY.—A recent summary of rural power extension in the Province of Ontario estimated that by Oct. 31 of this year 955 miles of line would either have been built or would be under construction—an increase of about 80 miles over the 1927 program. In eight years the Hydro-Electric Power system has built more than 4,000 miles of rural lines, serving 31,000 customers and costing $8,950,000. The 955 miles approved throughout the province this year represents an estimated cost of $2,265,000.

TRANSMISSION-LINE BUILDING IN INDIANA.—Energizing by the Interstate Public Service Company of its new 66,000-volt transmission line connected with the loop of the Central Indiana Power Company north and west of Newcastle, Ind., is announced. The new line, 16 miles long, is part of the loop linking Kokomo and Lafayette with the power plant at Dresser, Ind. The cost of building this section was about $85,000, and it was completed in five months. An addition to the Newcastle substation, the cost of which was $35,000, was also made.

ELECTRICITY CHEAPER THAN STEAM FOR CITY PUMPING. — That electric power will cost the city of Dallas less than steam power for a new central pumping plant is maintained by the Dallas Power & Light Company, which also insists that the annual operating costs will be less. The power company maintains that the city would have to spend $400,000 more to install the steam

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue for July 7, page 48.]

American Society of Mechanical Engineers—Engineering Societies Bldg., New York, Dec. 3-7. C. W. Rice, 29 West 39th St., New York.

American Society of Agricultural Engineers—Rural Electric Division, Hotel Sherman, Chicago, Dec. 6-7. Raymond Olney, St. Joseph, Mich.

Electrical Credit Association — New York Division, New York, Dec. 17; W. J. Kreger, 261 Broadway, New York.

American Engineering Council—Annual meeting, Washington, Jan. 14 and 15. L. W. Wallace, 26 Jackson Place, Washington.

North Central Electric Association — Engineering Section, Minneapolis, Jan. 21-22. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

American Institute of Electrical Engineers—Winter convention, New York, Jan. 28-Feb. 1. F. L. Hutchinson, 33 West 39th St., New York.

Midwest Power Conference — Chicago, Feb. 12-16. G. E. Pfisterer, 53 W. Jackson Blvd., Chicago.

plant than it would to install the electric plant. In addition, the company believes that the electric fuel bill will be $20,000 a year less than if steam is used. The city will call in "experts" to study the situation and report.

UTILITIES POWER & LIGHT CORPORATION PAYS $20,000,000 FOR CHICAGO BUILDING.—Purchase of the building of the Continental National Bank of Chicago by the Utilities Power & Light Corporation for a price said to be $20,000,000 was announced last week. A new corporation has been formed to take title to the building, to be known as the 208 South La Salle Street Corporation. For some years the Utilities Power & Light Corporation has owned and occupied the twelve-story structure known as the Utilities Building, at 327 South La Salle Street. The corporation will remain there for the present, and plans are under way to add five stories to this building.

DYERSBURG (TENN.) MUNICIPAL PLANT EXPANDS.—The city authorities of Dyersburg, in west Tennessee, have contracted almost to triple the capacity of the municipal light and power plant by the immediate addition of a 3,000-kw. turbo-generator at a cost of $70,000. This unit, which will serve a new industrial establishment, brings the total capacity of the plant to 4,700 kw.

MANILA ELECTRIC COMPANY PLANS EXPANSION. — The Manila Electric Company plans to seek a 50-year franchise from the Philippine Legislature authorizing the company to establish and operate plants in any part of the Philippine Archipelago, according to an announcement made on Nov. 17 by the Department of Commerce and based on information received from the Trade Commissioner at Manila. The plan will not affect the city of Manila.

TO SPREAD ELECTRIC NETWORKS IN MANITOBA.—An extensive hydro-electric development program by which electric power would be delivered to nearly every town in Manitoba as well as to the farming districts was outlined recently by Donald G. McKenzie, newly appointed Minister of Natural Resources. Mr. McKenzie announced that the government has decided to introduce legislation providing for the payment of one-half the capital costs of all transmission lines, including a line to Brandon, new lines to all towns in Manitoba, all farm lines and lines now built.

DEFIANCE, OHIO, VOTES DOWN MUNICIPAL PLANT PROJECT. — The City Council of Defiance, Ohio, has voted unanimously to accept the rate proposed by the Toledo Edison Company, following defeat of a proposal for a municipal power plant. The new rate covers domestic service, street lighting and a boulevard system. The new domestic rate is 8 cents a kilowatt-hour for the first 30 kw.-hr., 5 cents for each kilowatt-hour over 30 and 75 cents minimum charge. An electric rate war had raged in Defiance for six years, with phases that went to the State Supreme Court and sent local voters to the polls for three successive referendums on a municipal light plant. That plan was defeated at the fall election by 1,065 majority.

ELECTRICITY COMES TO THE AID OF MEDICINE.—An electric machine which measures instantly the hydrogen ion concentration of the blood in terms of thousandths of a volt and which therefore is of assistance in the diagnosis and study of cancer and a number of other diseases has been perfected at the University of Pennsylvania, according to an announcement made at that institution. The machine consists essentially of a specially designed multi-range precision voltmeter, having four one-hundred division ranges between

zero and one volt, with an accuracy better than one-half of 1 per cent on all ranges; a range-changing switch with associated resistors; a slide-wire voltage divider (single-turn potentiometer); a 1½-volt ignition type of dry cell, and miscellaneous accessories, according to Charles Weyl, of the faculty of the university's Moore School of Electrical Engineering, who perfected the apparatus for a group of chemists, physicists and medical men. The photograph shows Professor Weyl and the apparatus.

CITY LIGHTING EXPERIMENT AT MARION, IND., COMES TO END.—A municipal lighting experiment in the city of Marion, Ind., which has been in operation for more than a year, ended Nov. 17, following action in the Wabash Circuit Court, and the city will be compelled in the future to buy its electricity from the Indiana General Service Company. The Mayor and the City Attorney of Marion announced to the court that an agreement had been reached as a result of which the city wished a finding entered for the plaintiff in the suit of the Indiana General Service Company against the city of Marion. In granting this request the court found that a contract between the Marion officials and Fairbanks, Morse & Company, under which it had purchased machinery for the municipal experiment, was void and the city should be enjoined from carrying out the contract. By this action the city is technically without means of generating its power and therefore must buy from the public service company.

NORTHERN NEW YORK UTILITIES WILL REDUCE RATE IN WIDE TERRITORY.—A reduction of 1 cent per kilowatt-hour on the top rate for every house and farm in the entire territory served by the Northern New York Utilities was announced at a mass meeting at Watertown, N. Y., on Nov. 23 by Floyd L. Carlisle, chairman of the board of the corporation named. The territory benefited by the reduction reaches from Malone to Oswego. Twenty-five thousand persons will share in the reduction.

READY FOR LEWIS RIVER DEVELOPMENT. — An agreement between the Cowlitz County (Wash.) Commissioners and the Northwestern Electric Company of Portland, Ore., paving the way for the company to undertake a five-million-dollar hydro-electric development on the North Fork of the Lewis River, has been signed. Preliminary surveys have been completed, and actual construction may start within a few weeks.

KANSAS FARMERS MAKING LARGE USE OF ELECTRICITY WIN SUBSTANTIAL REWARDS.—An indication of the part electricity may take in farm prosperity is the fact that the ten "master farmers" of Kansas, selected last week from contestants representing 77 counties, all make widespread use of electric power in the operation of their farmsteads. Selection of the ten "master farmers" was made from 375 nominations, and the achievements of the winning contestants are being widely heralded in newspapers and farm publications. The average net value of being designated a "master farmer" in 1928 is $98,950, an aggregate of nearly a million dollars for the ten men.

SECOND I.M.M. ELECTRIC LINER IN SERVICE.—The *Virginia*, second electric passenger liner to be built for the Panama-Pacific Line of the International Mercantile Marine Company, received its builders' trials Nov. 19 and was taken over by the owners Nov. 27, when it started on its first trip—from Newport News, Va., to New York City. This liner, built by the Newport News Shipbuilding & Dry Dock Company and completely electrified by the General Electric Company, is a sister ship to the *California* and marks another step in the extensive modernization plan now being carried out by its owners. A third vessel, practically identical with the first two, is already under construction. The three vessels, the largest commercial steamships to be built under the American flag, are of twin-screw design, each propeller being driven directly by an 8,500-hp. motor.

IMPROVEMENTS FOR AKRON (OHIO) GENERATING STATION.—An improvement program, to cost $325,000, at the Northern Ohio Power & Light Company's "Gorge" power plant at Akron will be started in 60 days, officials of the company have announced. The entire station will be modernized and its capacity increased to 50,000 kw. The improvements will include installation of automatic boiler-control equipment and a treating plant to purify the boiler-feed water.

NEW ORLEANS COMMISSIONER OPPOSES RATE INCREASE.—An unfavorable report has been made to the New Orleans Commission Council by William T. Hall, Commissioner of Public Utilities, on the ordinance introduced by Commissioner Walmsley calling for a reduction of 30 per cent in the electric rates charged by the New Orleans Public Service, Inc., and a refund of 30 per cent on charges from 1922 to date. Mr. Hall declared that the rates charged by the company are perfectly legal. By the settlement ordinance of 1922 a return of 7½ per cent was authorized. The Walmsley resolution, Commissioner Hall said, would reduce the return to 4½ per cent and its enforcement would be enjoined as confiscatory.

COMMERCE DEPARTMENT TO STUDY DISTRIBUTION COSTS OF ELECTRICAL EQUIPMENT.—Announcement is made at Washington that a thorough survey of problems encountered in the distribution of electrical equipment is to be undertaken by the Domestic Commerce Division of the Department of Commerce at the request of the National Electrical Wholesalers' Association. The study is to be conducted in a typical jobbing establishment of moderate size in a Southern city. The aim of the study, the announcement says, is the elimination of wasteful processes through more complete knowledge of the proper allocation of costs for each service to each commodity and customer, as well as other factors such as the cost of handling consignment goods and the nature and efficiency of the various forms of retail outlets.

CONSOLIDATION OF UTILITY COMPANIES DISCUSSED BY INVESTMENT BROKER.—Consolidation of a majority of the public utility corporations of this country into five gigantic groups within the coming decade was predicted by Albert J. Hettinger of the Industrial Research Corporation at a luncheon given at the St. Charles Hotel, New Orleans, on Nov. 22 by Moore, Hyams & Company, investment brokers of that city. "Since 1925 there has been a gradual consolidation of the public utility corporations," said Mr. Hettinger. "This has been particularly true of the electric corporations, which have banded together to supply various sections of the country; and the results have shown that the cost to the consumer has been materially lowered while the efficiency of the serving company has been greatly improved."

Commission Rulings

SHOULD WHOLESALE COMMERCIAL RATES INCLUDE LIGHTING?—In adjudicating a complaint concerning rates brought by the Horn & Hardart Baking Company, Camden, N. J., against the Public Service Electric & Gas Company, the New Jersey Board of Public Utility Commissioners sustained the contention of the baking concern that by reason of the amount of energy it consumed and the manner in which it was used, as well as its equipment and other circumstances, it was entitled to a wholesale power rate. The utility was willing to supply the bakery under the wholesale power rate for energy used for power purposes, but not for electric lighting. The board observed: "It is a matter of common knowledge that many factories work overtime and therefore their use would come on the peak load of the lighting service, and during the periods of such use they would be in the same class as the petitioner."

RESTRICTIONS ON OPERATION BY A MUNICIPAL PLANT IN ANOTHER MUNICIPALITY.—The town of Minocqua, Wis., instituted commission proceedings to acquire an electric plant owned and operating within its boundaries by the village of Eagle River. The Wisconsin Railroad Commission held that a municipality acting in its proprietary capacity as the operator of a public utility in another municipality accepts thereby an indeterminate permit subject to all the limitations, restrictions and regulations imposed by law upon the holder of such a permit in the same degree as a private corporation under like circumstances and that such a municipality is subject to the statutory rights of the latter to condemn property for public use. The commission therefore upheld the right of the town as against the village, ruling against three contentions denying the regulating body's jurisdiction.

ALLEGED UNREASONABLENESS OF RATES MUST BE PROPERLY ESTABLISHED.—Dismissing without prejudice a complaint by the Mayor of Grandview, Mo., that the rates of the Missouri Public Service Company were excessive, the Missouri Public Service Commission said that it would not be justified in issuing an order permitting a rival electric company to enter and serve this territory since the rival company had on record no application for a certificate granting such authority but merely an informal letter offering certain rates if permitted to serve. Rates will not be declared unreasonable, the commission went on to say, simply by comparison with tariffs of companies in adjoining territory, in entire disregard of the cost of similar service in different communities, the property employed in rendering the service, amounts fixed for depreciation and return, and other factors which must have consideration in the fixing of rates.

PROHIBITION AGAINST RESALE OF ELECTRICITY.—The Virginia Electric & Power Company has brought before the Virginia Public Service Commission in an informal way the legality of a utility company's rule prohibiting the resale of energy by its customers in the case of apartment-house owners who desire to purchase for their apartments under the utility's wholesale rates and then resell to the tenants, either by including an additional charge in the rent or by putting separate meters in the apartments and charging the tenants the company's retail rates. The owner of an office building in Roanoke and the owner of an apartment house in Richmond have objected to this rule. The commission has informally taken the position that the regulation will not be held to apply where there are no separate meters placed in the separate offices or apartments rented and where there is no restriction placed on the tenants as to the amount of energy that can be used, but that wherever there are restrictions on the tenants, or where separate meters are installed by the owners of the building, the practice results in discrimination against the company's other customers. The owner of the apartment house purposes to test the matter in a formal way through the commission and the courts.

Recent Court Decisions

COMPANY'S DISCRETION IN SELECTING ROUTE FOR RIGHT-OF-WAY.—In Cleveland Electric Illuminating Company vs. Cotabish, proceedings were brought to appropriate certain rights and easements across the defendant's parcels of land for the location, construction and maintenance of a transmission line. The court held that a corporation having the power to appropriate property has primary discretion in determining what land is necessary in order to be authorized to make appropriations. The courts have power to prevent an abuse of that discretion, but the company did not abuse its discretion in appropriating lands for its transmission line over the longer of two routes. (162 N.E. 475.)*

SYNDICATE TAKING OVER LIGHTING BUSINESS NOT LIABLE ON PREDECESSOR'S CONTRACT FOR FREE SERVICE.—The mere fact that the property and capital stock of a power company were transferred to a syndicate which took over its predecessor's business, said the Supreme Court of Iowa in Hess vs. Iowa Light, Heat & Power Company, did not render the syndicate liable on a contract binding its predecessor to furnish free light and heat to the director of the company—there being no merger or consolidation involved—and a letter to this consumer advising him that the free service would be discontinued at the end of the existing heating system relieved the syndicate of liability. (221 N.W. 194.)

APPLICANT FOR SERVICE MAY BE RIGHTLY REFUSED IF HE OWES FOR SERVICE PREVIOUSLY RENDERED AT OTHER PREMISES.—In Clark vs. Utica Gas & Electric Company, the Appellate Division of the New York Supreme Court refused to sanction striking from the record as insufficient in law the company's defense against an action to compel restoration of discontinued service. The company said that service had been discontinued because of the plaintiff's failure to pay a bill for energy supplied previously at other premises, and it was maintained that this could not be adduced to justify refusal to serve the same customer at his new abode. The court found that the law bore no such construction, that the defendant's defense was adequate, and that the case must be fought on the issue whether the customer did or did not owe the company as alleged.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

News About Men of the Industry

F. J. Gannon Appointed Manager in El Paso

F. J. Gannon has been appointed manager of the El Paso (Tex.) Electric Company, to succeed Joseph Bowes, who has been named vice-president of the Virginia Electric & Power Company. Mr. Gannon has been vice-president of Davis Islands, Inc., Tampa, Fla., organized for the development of the islands of Tampa Bay. He has been in the public utility field for the past 26 years, serving continuously during that period in various capacities for the Stone & Webster organization. He started in the general offices of that company in 1902 and after four years of training he was transferred to Dallas, where he became connected with the light, power and railway company in that city. Subsequently he was connected with the Pawtucket (R. I.) Electric Company, with the Edison Electric Illuminating Company, Brockton, Mass., as assistant treasurer and with the Reno Power, Light & Water Company and the Truckee River Power Company in the same capacity.

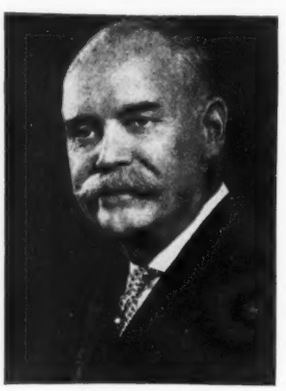
OWEN D. YOUNG, chairman of the board of directors of the General Electric Company, has been appointed to the board of trustees of Teachers' College, Columbia University, New York. Commenting upon Mr. Young's appointment, Dean Russell said: "I am intensely gratified to have a man of Mr. Young's reputation as a member of the board of trustees. He is peculiarly fitted to help this school in its endeavor to assist in the creation of a more effective educational system."

FRANK B. JEWETT, vice-president of the American Telephone & Telegraph Company, in charge of development and research, has been appointed chairman of the National Research Council's committee to co-operate with the officials of the Chicago World's Fair in developing the scientific theme of the city's centennial celebration. The personnel of the committee includes also Gano Dunn, president of the J. G. White Engineering Corporation, and Dr. Michael I. Pupin, professor of electrical mechanics at Columbia University.

DR. HARVEY N. DAVIS was inaugurated president of Stevens Institute of Technology at Hoboken, N. J., last week in the presence of representatives of universities, learned societies and educational and scientific associations throughout the country. Preceding the installation a scientific session was held in the auditorium of the Institute, at which Dr. Robert A. Millikan of the California Institute of Technology and Prof. John Johnston, director of research of the United States Steel Corporation, made addresses. Among the speakers at the inauguration were Governor Moore of New Jersey and Dr. Abbott Lawrence Lowell, president of Harvard University. Dr. Davis outlined his ideas of the ideal engineering school.

Thomas E. Murray Resigns

Thomas E. Murray, vice-chairman of the board of directors of the New York Edison Company, has tendered his resignation. Mr. Murray was senior vice-president of the company until the recent merger of the Brooklyn Edison Company and the New York Edison Company. He had expressed



Thomas E. Murray

a desire for some time to be relieved of his duties as soon as the merger became effective in order to be free to work out his ideas for improvements in steam generation and electrical distribution.

Mr. Murray ranks among the foremost men in the electrical industry. He has been intimately associated with the development of utilities in the Metropolitan district and, in addition, has contributed greatly to engineering progress through design and invention. His foresight and vision are attested by 350 patents and his versatility by the fact that in 1910 he advocated household electric refrigeration and more recently developed the water-walled boiler furnace. He is an officer in the Manhattan Refrigerating Company, the Electrical Testing Laboratories, the Metropolitan Engineering Company and Thomas E. Murray, Inc. He planned many of the generating stations in the New York area, contributed greatly to the improvement of boilers and accessories and developed a system of safety devices and protective appliances for interior wiring.

The achievements and inventions of Mr. Murray have brought him honors from universities and professional societies and further notable contributions may be expected now that he can devote more time to the engineering work in which he is so greatly interested.

Roy Thurman Named Commercial Manager

Roy Thurman, long identified with the electric power and light industry in Indiana, has been appointed commercial manager of the Indianapolis Power & Light Company to succeed M. K. Foxworthy, recently resigned. He will assume his new duties Dec. 1. Mr. Thurman has been assistant to Mr. Foxworthy in the promotion of new business. Prior to this association he was general manager of the Muncie, Ind., division of the Indiana General Service Company. Following the completion of his technical education at the Rose Polytechnic Institute he entered the employ of the General Electric Company at Schenectady, N. Y., in the testing department and shortly after was transferred to the commercial department. After obtaining commercial experience there and at Pittsfield and Lynn, Mass., he was sent to Cincinnati as sales manager. Remaining in Cincinnati three years, Mr. Thurman became power engineer with the Indiana General Service Company at Muncie, Ind. He soon was made commercial manager and promotion to the position of general manager of that district followed in a short time. Mr. Thurman is a past-president of the Indiana Electric Light Association and a past-vice-president of the Indiana Engineering Society.

GEORGE O. EATON has been appointed chief electrical engineer of Charles H. Tenney & Company, Boston, Mass., to succeed L. R. Hicks, who recently resigned to join the Electric Bond & Share Company organization. Mr. Eaton was graduated from the Massachusetts Institute of Technology in 1915 in the electrical engineering course, and after a year in the testing department of the General Electric Company at Schenectady and Erie he joined the Tenney engineering department at Boston as assistant engineer. In 1926 he was appointed first assistant electrical engineer. During his connection with the Tenney group of properties Mr. Eaton has had wide experience in power station design, substation, transmission and distribution system developmental work, and has been actively identified with the growth of the utilities under the management of this house in New England and New York state.

J. H. WARDEN has been appointed sales manager of the El Paso Electric Company to succeed H. C. Webb, Jr., who has assumed new duties in Virginia. Mr. Warden was acting sales manager of the El Paso Electric Company at the time of his transfer to Lake Charles, La., in the spring of 1927. At that time he was named industrial power sales engineer for the Gulf States Utili-

ties Companies, Louisiana division, later becoming sales manager. Mr. Warden's first experience with the El Paso Electric Company was in the engineering department in 1922. A short time after he was transferred to the sales department as power sales engineer, later became assistant sales manager and subsequently acting sales manager.

H. C. Webb, Jr., sales manager of the El Paso Electric Company, has been transferred to the Virginia Electric & Power Company as sales manager of the Richmond division. Mr. Webb has engaged in sales work for the Stone & Webster organization as an employee of the Baton Rouge Electric Company and the Gulf States Utilities Companies as well as for the El Paso company.

Major Francis K. Newcomer has been appointed assistant chief engineer of the Federal Power Commission. Major Newcomer assumes his new duties with the commission after a tour of duty as an instructor at the Army Engineer School. He also served five years at West Point as associate professor of mathematics. During the war Major Newcomer served in France with the Fourth Division. He has been district engineer at Boston and at Charleston.

Obituary

Col. Robert H. Timmons, assistant to the vice-president of the Kansas Gas & Electric Company, Wichita, and for more than a decade a figure of prominence in the electrical industry of the Middle West, was drowned Nov. 23 when the heavily laden motor boat he occupied with three companions capsized in the Lake of Service near Parsons, Kan. A newspaper man for many years prior to his connection with the utility business, Colonel Timmons served the Atlanta (Ga.) *Constitution* and other papers of recognized standing in the South. He joined the ranks of the Kansas Gas & Electric Company in 1918 as head of the securities and public relations department. He held many positions of honor in various civic, political and public utility organizations. During his incumbency of the presidency of the Kansas section, National Electric Light Association, the organization attained the greatest growth it had ever enjoyed. An accomplished speaker, his services were constantly in demand by organizations of almost every character in the Middle West. Colonel Timmons was 48 years old.

W. Winkler-Forazest, a pioneer in electrical engineering work in Austria, died recently at Klagenfurt, at the age of 71. Mr. Winkler-Forazest was associated with the construction of the first Edison and Gramme dynamos in that country. For many years he was the electrical engineer of the city of Klagenfurt, introducing many innovations in its electric generating and distribution system.

Arthur F. Buss, consulting electrical engineer, with headquarters in Los Angeles, died suddenly at his home in that city. A native of Oakland, Mr. Buss received his technical training at the Engineering College at Oakland. In 1920 he was employed by the General Electric Company in the capacity of building equipment specialist at San Francisco, and later in Los Angeles in the same capacity. He opened offices in Los Angeles in 1922 as consulting engineer. Among the buildings for which Mr. Buss designed the electrical engineering are Warner Brothers, Title Insurance, Los Angeles Public Library, Monrovia and Glendale high schools and the Scottish Rite and York Rite Cathedral in Long Beach.

Nelson J. Young, assistant electrical engineer with the Rochester Gas & Electric Corporation, died Nov. 12 at the Park Avenue Hospital, Rochester, N. Y.

Thomas Fortune Ryan, financier, whose greatly diversified interests have made his identification with electric public utilities rather obscure, died Nov. 23 at his home in New York at the age of 77. Among his activities in the electrical field were his contributions to the development of New York's street railway and subway development. He also had substantial interests in the Electric Storage Battery Company, Hocking Valley Railway, Consolidated Gas Company and the Union Elevated Railroad Company of Chicago. When he retired from active business, twenty years ago, it was said he controlled public utilities and other enterprises valued at $1,500,000,000, and at the time of his death his personal fortune was said to exceed $100,000,000 and was estimated by some to total $500,000,000.

Charles Bruce White, Chicago representative of the Cochrane Corporation and vice-president and general manager of the Cochrane Engineering Company, Chicago, died at his home Oct. 16. Mr. White's first positions were with the old Edison Company and the Thomson-Houston Company, and about 1891 he had charge of the building of some of the first electric railroads that were built in the South, at Lynchburg, Va. Subsequently he removed to Chicago and was chief electrician for the Calumet Street Railway, salesman for the Western Electric Company, and in 1900 became manager of the Sprague Electric Company's St. Louis, Mo., branch office. In 1901 he became associated with A. Sorge, Jr., & Company, who were then representing the Harrison Safety Boiler Works (now the Cochrane Corporation), with which organization he was associated until the death of Mr. Sorge seven years ago. He was then made vice-president and general manager of the Cochrane Engineering Company, which succeeded A. Sorge, Jr., & Company.

Strickland L. Kneass, engineer and inventor, died Nov. 24 at his home near Philadelphia, following a short illness. A graduate of Rensselaer Polytechnic Institute, Mr. Kneass became widely known for his inventions of devices used in steam engineering and as an authority on thermodynamics. His scientific achievements were recognized by many engineering societies, including the Franklin Institute, which association awarded him the John Scott medal in 1904. He was contributor of articles on thermodynamics, non-ferrous metals and similar subjects to technical journals, was a trustee of Rensselaer Institute and a member of the National Institute of Social Science, the American Society of Mechanical Engineers, the Franklin Institute and other societies.

Lincoln Beerbower, manager of the northern division of the Oklahoma Gas & Electric Company, with headquarters at Enid, died suddenly Nov. 20 in Oklahoma City. He had gone to Oklahoma City to attend the annual conference of managers and employees of the Oklahoma Gas & Electric Company. Mr. Beerbower was one of the oldest employees of the company, having entered its employ in Oklahoma City as bookkeeper in 1904. Later he was transferred to Enid, where he was engaged in many civic enterprises and had been president of the Enid Chamber of Commerce and Rotary Club. He was also a district chairman of the speakers' bureau of the Oklahoma Utilities Association.

Edwin Wales Robertson, whose death was noted in the Nov. 24 issue of the Electrical World, was widely known not only in banking circles but also in the public utility field. At the time of his death he was chairman of the board of the National Loan and Exchange Bank of Columbia, of which his son is president. Until recently he was head of the Columbia Railway, Gas & Electric Company, which operates the city's utilities. These properties, together with the Parr Shoals power plant on the Saluda River, are evidence of his vision and activity in this field of endeavor. A native of Columbia and a graduate of Yale University and of the law department of the University of South Carolina, Mr. Robertson soon became an outstanding figure in banking circles in his native city. In 1903 he obtained control of the Columbia Electric Street Railway, Light & Power Company, the name subsequently being changed to the Columbia Railway, Gas & Electric Company. In 1912 he acquired, with associates, control of the Parr Shoals Power Company, which has constructed the large dam and power house at Parr Shoals. Four years ago Mr. Robertson disposed of his holdings in these utility organizations.

Financial and Statistical News

Market Active After Two-Day Holiday

FOLLOWING the week-end holiday which was necessitated by the hectic trading of last week the market continued active but somewhat more cautious and the result was a combination of gains and losses. Many of the leading issues established gains, while some issues moved downward. In the utility group American & Foreign Power advanced from 54 to 60, Detroit Edison from 201 to 212, Columbia Gas & Electric from 129 to 134. Slight gains were also made by Federal Light & Traction, Electric Power & Light and American Power & Light

Trading on the Curb during the week was also rather irregular. The utilities showed some gains and a few losses. Early in the week advances were reported by United Gas Improvement, Consolidated Gas, Electric Light & Power Company of Baltimore and Electric Bond & Share, while American Superpower eased a little.

Penn-Ohio Utility Merger Approved

At special meetings of stockholders of the Penn-Ohio Edison Company, the Penn-Ohio Securities Corporation and the Northern Ohio Power Company, held Nov. 14, the proposal to merge the three companies was unanimously approved. The merger will require no further action by the stockholders of the Penn-Ohio Edison Company as the several stock issues of that company automatically became the stock issues of the merger company. In the cases of the Northern Ohio Power Company and the Penn-Ohio Securities Corporation the stockholders will be notified shortly as to the time and manner of surrendering their certificates in exchange for the securities of the Penn-Ohio Edison Company.

Public Utilities Securities Corporations Formed

The Public Utilities Securities Corporation has been organized under the laws of Delaware to acquire securities of various kinds and especially the common stocks of successful public utility companies. The new company will have an authorized capitalization of 200,000 no-par shares of $6.50 cumulative participating preferred stock, of which 40,000 shares will be outstanding, and 200,000 no-par shares of common stock, of which 80,000 shares will be outstanding. Harley L. Clarke, president of the Utilities Power & Light Corporation, will be president of the new company. Others on the board of directors will be William F. Ingold of Pynchon & Company; Walter S. Hammons, president of W. S. Hammons & Company; Charles W. Higley, president of the Hanover Fire Insurance Company, and William T. Bruckner, vice-president of the Continental National Bank & Trust Company of Chicago.

Utility Equities Corporation has also been organized by Chase Securities Corporation, Stone & Webster, Inc., and their associates for the purpose of holding, buying and selling securities of public utility and other companies in the United States and foreign countries. The capitalization of the company will consist of 165,000 shares of $5.50 dividend priority stock, no par value, and 1,320,000 shares of common stock of no par value.

Puget Sound Stock Issue Approved

Directors of the Engineers Public Service Company have authorized the issuance of 246,662 shares of common and 98,665 shares of $5.50 dividend preferred with warrants, to be issued in exchange for Puget Sound Power & Light Company stock. The directors also voted to purchase from the Puget Sound Company $7,500,000 of junior preferred, in accordance with the plan announced Oct. 5. More than 75 per cent of the Puget Sound Power & Light Company common is now deposited or owned by Engineers and it is expected that the Engineers stock issuable in exchange will be ready for delivery about Dec. 1.

Small Isolated Utility Yields Inadequate Returns

Utility Industry Shows Better Results Than Any Other in Respect to Proportion of Industrial Units Which Are Profitable

WHILE 33 per cent of all the public utilities in the United States (exclusive of transportation) reported no net income for the year 1927 to the Bureau of Internal Revenue an analysis of the figures by the department of statistical research of the National Electric Light Association shows that these companies received only 5 per cent of the total gross income. In other words, while only 67 per cent of the companies earned a net revenue these companies represented 95 per cent of the production. This is a better showing than that which has been made by any other industry.

It is interesting to note that while the average gross revenue of the companies reporting net earnings was $425,750, the average gross revenue of the companies reporting no net income was only $47,100. This is one more indication that the day of the small isolated public utility is over. The trend of the average unit rate for the whole United States has been steadily downward for years and with greatly increased operating expenses it is only the large system that can show adequate returns on the money actually invested in the public service. The isolated plant has a relatively much higher unit cost of production, and in the face of the public demand for lower rates and continued improvement in service it cannot charge a rate which will pay a fair return on the property.

The left-hand side of the accompanying table, prepared by the statistical research department of the N.E.L.A., for various industries shows the percentage of companies reporting a net income, the percentage of the total gross income earned by these companies and the average income per corporation. The right-hand side shows the percentage of companies reporting no net income, the

CORPORATION RETURNS FOR 1927 BY MAJOR GROUPS

	Reporting a Net Income			Reporting no Net Income		
	Per Cent of Total Number	Per Cent of Total Gross Income	Average Income per Corporation	Per Cent of Total Number	Per Cent of Total Gross Income	Average Income per Corporation
Mining and quarrying	28	52	$389,500	72	48	$139,350
Agriculture	45	78	138,300	55	22	32,150
Service organizations	54	66	140,500	46	34	86,100
Amusements	50	76	202,000	50	24	59,250
Professional	54	49	67,700	46	51	82,150
Business	58	85	164,700	42	15	38,250
Financial organizations	57	77	141,100	43	23	55,200
Insurance companies	55	86	2,158,000	45	14	429,000
Transportation	57	85	1,174,000	43	15	283,300
Manufacture	58	81	828,600	42	19	261,550
Construction	58	79	230,500	42	21	85,750
Trade	61	84	442,500	39	16	132,600
Public utilities	67	95	425,750	33	5	47,100
All corporations	55	81	$411,517	45	19	$119 652
Same for 1926	58	83	457 212	43	17	122,259

percentage of the total gross income earned by these companies and the average income per corporation.

The table emphasizes one of the major trends of American industrial progress, the concentration of successful business in larger units which, because of the economies effected by mass production, are able to show profits and at the same time reduce the cost of service.

Uniform State Regulation Urged*

Investment Banker Discusses This and Other Pertinent Public Utility Problems of Current Interest

By Henry R. Hayes
Vice-President Stone & Webster and Blodget, Inc.

WE HAVE witnessed an exceedingly active discussion of public utilities, especially during the past twelve months. Never before has there been a year when the utility business has enjoyed so much attention. I say "enjoyed" advisedly because of a sanguine belief in the outcome. I believe that out of this discussion and study of your business there is surely coming an enlightened public appreciation and understanding of the real factors which have made the industry great and essential to the industrial, agricultural and domestic needs of this country.

So I am prompted to ask, What are some of these factors which have made the public utility business so important? It is not alone the fact that the industry has possessed farsighted technical staffs, has been efficiently organized and has been efficiently managed. It is not alone because it has been a pioneer constantly bringing new services to users. It is due, I believe, in no small measure to the wise theory of and the sound standards and practices developed under public supervision and regulation during the industry's growth. That system of statewide regulation year by year becomes more efficient. It has been helpful in the elimination of needless and destructive competition. It has prevented exorbitant rates. Supported by very uniform court decisions, this wise public policy of state regulation has afforded investors stability to such an extent that securities of the industry rank high among conservative investments.

That stability of investment is one of the prime factors which has permitted the industry to command funds for its ever-increasing needs. Without it we would have lacked the financial means for the expansion which we have already witnessed.

None of us here will doubt for an instant that public utilities are destined for still greater expansion. So it would seem wise, at a time when the industry happily enjoys prosperity, to improve those conditions which have led to the stability of the business rather than to consider new theories or to revert to the discarded practice of public ownership with public operation.

Heretofore the opinion against private ownership and operation of the public utility business has been disorganized. There is little to be said in favor of refusing to discuss openly the fact that this opinion has become exceedingly well organized and does not lack champions to voice the cause. There is much to be gained, on the other hand, by a public recognition of the existence of this situation. I have listened to or read arguments against private ownership and state regulation, and many times I have noted incorrect presentation of facts. In numerous cases I have felt politics was the dominant motive for the attack, but I prefer to believe that these opponents entertain beliefs and motives which are sincere and not politically selfish. I urge these opponents to present their views in such detail as to disclose precisely wherein statewide regulation, in their opinion, may have failed. The attack against statewide regulation, including the important element of fair valuations of properties, has been, it seems to me, altogether too general. Criticism, general in character which does not carry clearly the reasons for and facts upon which such criticism is based, is harmful today. It is harmful because it lessens the widespread confidence entertained today by management of and investors in the public utility business, who believe in the sound public doctrine of state regulation.

Interested and disinterested students of the public utility industry will not rightly claim that we have attained in this country perfection of standards and practices for state regulation. That is why so much thought has been given publicly to this subject.

Progress Toward Uniformity

Representing bankers' views in a discussion of regulation recently I had occasion to state publicly that the Investment Bankers' Association of America "has repeatedly urged broad and more uniform state regulatory laws liberally supported by legislatures. If there has been ineffectiveness in state regulation, it is due primarily to the inadequate powers vested in the commissioners and the inadequate appropriations voted by the legislatures."

As you well know, real progress has been made recently in the interests of more uniformity in regulatory laws. I refer to the final approval of the uniform public utilities act and its adoption at the thirty-eighth annual meeting of the National Conference of Commissioners on Uniform State Laws. That act, I understand, has the indorsement of important organizations such as the National Association of Railway and Utilities Commissioners, the American Bar Association, the National Municipal League, the National Civic Federation, the Investment Bankers' Association of America and leading economists and many others.

It seems to me, not only here in Virginia but in the southeast generally, there is a real need for more uniform regulation. This is especially so in view of the interconnection of power lines which has taken place, and to assist further the extension of such lines in the future. More uniformity in commission regulation is essential to enable the operating companies to command a freer flow of money into the business for expansion. The latter would be particularly true should the southeastern states adopt the indeterminate permit or franchise as set forth in that uniform public utilities act.

The principle of the indeterminate permit or franchise is not new. In fact, it is in operation in many states. There have been some abuses but it seems to me that the provisions as contained in the uniform public utilities act are in accord with the best practice and duly safeguard public interests. The value of the indeterminate permit or franchise has long been appreciated by investment bankers as affording the best safeguards for honest investment in the business. This is further substantiated by the evident fact that large institutional purchasers much prefer bonds of a public utility company operating under an indeterminate permit granted by broad regulatory laws.

For a good many years we have all heard talks and charges to the effect that the public utility industry has been making exorbitant profits. The deduction seems to be that these exorbitant profits have been made because commissions have not performed their duty, although I have not heard of this charge actually being made. In theory, all will agree that public utilities under proper statewide regulation could not make exorbitant profits. Therefore, it seems to me to be obviously unwise to attempt to interfere with or break down such regulation, especially when we have such notable examples of failure in public ownership and operation. The constructive thing to do would seem to be to improve state regulation wherever needed. To do otherwise would not only cramp a needed development of the public utility industry but would seriously impair the business of legitimate industrial concerns and be harmful to that vast number of employees engaged in legitimate business enterprises who are dependent upon the well-being of the public utility business.

From an address presented at the annual convention of the Public Utilities Association of Virginia.

Utility Securities Listed on Boston Exchange. — There have been placed upon the Boston Stock Exchange list $2,000,000 first lien and refunding mortgage gold bonds of the Houston Lighting & Power Company.

North Boston Lighting Plans $3,000,000 Stock Issue

Stockholders of the North Boston Lighting Properties met at Boston, Mass., Nov. 22 and authorized the issue of 60,130 additional shares of common stock at a minimum price of $50 for the purpose of furnishing capital to subsidiaries whose issues have been approved as follows by the Massachusetts Department of Public Utilities:

Company	Number of Shares	Price Fixed
Eastern Massachusetts Electric Company	14,440	$35
Malden & Melrose Gas Light Company	14,497	25
Malden Electric Company	31,712	55
Haverhill Electric Company	8,557	45
Gloucester Electric Company	4,783	65

At present the outstanding shares of North Boston Lighting Properties consist of 228,078 preferred and 373,222 common, the preferred sharing in common stock rights. A majority control is deposited in the hands of a voting trust affiliated with Charles H. Tenney & Company, managers of the subsidiary properties.

PACIFIC LIGHTING SHARES LISTED.—The Los Angeles Stock Exchange has authorized the listing of 122,646 additional shares of common stock, no par value, of the Pacific Lighting Company, bringing the total listing to 1,250,105 common shares.

UNITED ILLUMINATING COMPANY INCREASES CAPITAL.—Directors of the United Illuminating Company, New Haven, Conn., voted Nov. 9 to issue 56,647 shares of no-par-value stock. Stockholders of record Nov. 8 will be permitted until Dec. 15 to subscribe for the stock on the basis of $65 a share in the ratio of one share of new stock for each ten shares of old stock held. A payment plan allows for the payment on each share of $15 on or before Jan. 15, 1929; $15 on or before June 15, 1929; $20 on or before Oct. 15, 1929, and the final payment of $15 on or before Jan. 15, 1930. Interest will be paid at the rate of 4 per cent on full or part payments up to and including Jan. 15, 1930.

TEXAS UTILITY INCREASES CAPITAL STOCK.—The Dallas Power & Light Company has amended its charter by adding 87,500 shares of non-par value capital stock, giving the new stock a valuation of $1,750,000.

New Utility Issues Total $107,659,500 in November

DURING the month of November new offerings of electric light and power securities amounted to $107,659,500, as compared with $81,745,000 in October, and $182,231,000 in November, 1927. With only one month remaining to complete the new financing, this year's total for the eleven months ended Nov. 28 shows a decrease of $290,844,000 under the sum that was recorded for the similar period of the year 1927.

The largest individual loan was floated by the American Cities Power & Light Corporation in the form of convertible class A and class B stock, totaling $25,400,000. The new financing was essentially of a long-term nature, though three short-term issues appeared. The average yield reached the 5.44 per cent mark.

New Security Issues of Electric Service Companies in November

Name of Company	Amount of Issue (Par Value)	Period, Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Pacific Public Service Co	$3,400,000	2	Secured convertible gold notes	New capital	5½	98⅝	6.17
Georgia Power & Light Co	2,700,000	50	First mortgage gold bonds	To provide funds to retire outstanding funded debt, to reimburse for expenditures on betterments and for other corporate purposes	5	93¾	5.35
	859,500	..	Cumulative preferred stock		6	95½	6.28
Federal Public Service Corp	2,000,000	19	First lien gold bonds	To provide funds to purchase interests in public utility companies, to pay off indebtedness, for working capital and for other corporate purposes	6	99	6.10
Central Power Co	356,000	29	First mortgage gold bonds, series D		5	96½	5.23
Michigan Gas & Elec. Co	164,000	29	First mortgage gold bonds, series B		5	97	5.20
American Cities Power & Light Corp.	25,400,000	..	Convertible Class A stock and class B stock	Acquisition of securities	..	63½	....
Atlantic Public Utilities, Inc	700,000	10 mo.	Gold notes	To refund underlying obligations	5	99½	6
Carolina Power & Light Co	2,040,000	..	Cumulative preferred stock	New capital	6	102	5.88
Houston Lighting & Power Co	2,000,000	50	First lien and refunding mortgage bonds, series D	To reimburse for expenditures made for extensions and for other corporate purposes	4½	93	4.81
Iowa Railway & Light Corp	500,000	18	First and refunding mortgage gold bonds, series B	Extensions and additions to the properties	5	98	5.17
Keystone Public Service Co	3,600,000	50	First mortgage gold bonds	To provide funds for the acquisition of properties	5	98½	5.08
United Power & Light Corp. (Kans.)	1,000,000	19	First mortgage gold bonds, series B	Refunding and to reimburse for additions	5	97	5.25
New Orleans Public Service, Inc	5,000,000	27	First and refunding mortgage gold bonds, series B	To reimburse for expenditures made for additions to property, to retire bonds and for other corporate purposes	5	97½	5.17
Long Island Lighting Co	1,000,000	..	Cumulative preferred stock	Additions, extensions and improvements to the properties of the company	6	105	5.70
Central Illinois Public Service Co	5,700,000	40	First mortgage gold bonds, series G	To reimburse for cost of additions and extensions to property	5	100	5
Interstate Power Co	4,000,000	29	First mortgage gold bonds	To reimburse for expenditures for property additions	5	96	5
Louisiana Power & Light Co	2,500,000	..	Cumulative preferred stock	To reimburse for expenditures made for additions to property and for other corporate purposes	6	100	6
	4,500,000	30	First mortgage gold bonds	To reimburse for expenditures on additions and for other corporate purposes	5	97½	5.13
North American Water Works & Electric Corp	2,800,000	10	Convertible secured gold gonds, Series A	To reimburse for cost of acquisition of properties	6	98½	6.20
Public Utilities Securities Corp	3,940,000	..	Cumulative participating preferred stock	Acquisition of stock interests in certain utility companies and for other corporate purposes	6½	98½	6.60
Public Service Co. of Northern Illinois	10,000,000	50	First lien and refunding mortgage gold bonds, series D	Refunding and additions	4½	94½	4.80
Utility Equities Corp	16,500,000	..	Priority stock and common stock	To acquire additional holdings and for other corporate purposes	..	100	....
Keystone Water Works & Electric Corp	6,000,000	20	Firstlien gold bonds, series B.	Payment of indebtedness incurred in acquisitions	5½	97	5.75
East Coast Utilities Co	1,000,000	5	Convertible gold debentures, series A		6	99	6.20

Total	$107,659,500 (par value)	Rights	$13,787,155
Total amount actually realized	96,320,885	Total financing for November	110,108,040

Business News and Market Conditions

Industrial Activity Rate Well Sustained

ACTIVITY in most lines of industry continues at the high rate which marks 1928 out unmistakably as a record year. Relative to current activities and the outlook the Guaranty Trust Company of New York says in its current survey:

"After reaching the highest level on record last month, the rate of steel output has declined moderately in the last few weeks. It was estimated on Nov. 21 that the average rate for the industry had receded to approximately 81 per cent of capacity, as against 91 per cent or more in October. The slackening is attributed to the exceptionally active buying in September in anticipation of price advances. Notwithstanding the record-breaking production schedules last month, the volume of unfilled orders on the books of the United States Steel Corporation increased by 53,000 tons, and at the end of the month stood more than 400,000 tons above the figure recorded a year ago.

"Building contracts reported by the F. W. Dodge Corporation for October in 37 states had a larger total value than in any corresponding month on record, although the margin of gain over the figure a year ago was only 6 per cent.

"The automobile industry will probably establish a new high record in output for the year. Production last month totaled nearly 400,000 passenger cars and trucks, or about 180,000 more than in October, 1927. This brings the total for the first ten months of the year to a figure about equal to that for the similar period in 1926, the banner year of the industry. Although output and sales have declined moderately in recent weeks in response to seasonal influences, there is little possibility of any such sharp reduction as occurred in the closing months two years ago. The Ford plants alone, with the large volume of unfilled orders still on their books, could assure the maintenance of a comparatively high level of production for the remainder of the year."

Lighting Equipment Up 4.6 per Cent

The value of lighting equipment manufactured in the United States in 1927 was $251,449,061, according to the Department of Commerce, compared with $240,373,608 in 1926 and $217,793,077 in 1925.

The statistics are based on data collected from manufacturers of gas, electric and other lighting equipment and from establishments which assemble such equipment from purchased parts. Reports were received from 915 establishments in 1927, against 880 in 1926 and 797 in 1925.

Statistics for 1927 are given in the accompanying table.

Manufacture of Lighting Equipment

Class and Kind	Establishments Reporting	Value
Aggregate	915	[1]$251,449,061
Residence lighting fixtures, all types, total	..	58,862,528
Ceiling or chandelier type, Except kitchen units	223	16,279,870
Wall or bracket type, except kitchen units	200	7,258,812
Kitchen units:		
Ceiling type	95	646,629
Wall type	40	121,695
Portable lamps:		
Table	167	4,651,584
Floor	156	6,269,769
Bridge	117	3,098,651
Boudoir	97	1,552,752
Other	30	822,202
Adjustable lamps	25	312,295
Candelabra, candlesticks, and electric candles	72	781,919
Lanterns and outdoor standards	117	2,352,413
Not reported separately by kind	..	14,713,937
Commercial lighting fixtures, all types	..	18,441,088
Industrial lighting fixtures, all types	..	7,811,947
Factory or industrial	45	4,961,330
Car, steam and electric railroad	10	699,023
Railroad and traffic signal —semaphore, switch, track, etc	29	1,258,877
Office and drafting-room	18	104,331
Adjustable	11	238,283
Desk lamps	30	550,103
Street and highway lighting fixtures, all types	..	$11,138,798
Street and highway lighting	19	6,165,269
Posts and standards	24	4,973,529
Marine lighting fixtures	48	837,070
Shades for lighting fixtures, all types	..	14,628,534
Glass	69	2,379,169
Porcelain	10	128,630
Silk	123	7,788,798
Paper and parchment	80	2,307,569
Cretonne, linen, and other fabric	29	577,669
Tin, aluminum, brass, and other metal	11	89,699
Other	5	48,400
Not reported separately by kind	..	1,308,600
Globes, bowls, domes, chimneys, and other illuminating glassware, except shades and reflectors, all types	72	9,859,596
Reflectors— metal, glass and porcelain	78	2,918,587
Miscellaneous lighting equipment, total	..	117,549,569
Lighting equipment not distributed by class or kind	40	[2]7,744,221
Lighting fixtures and equipment not specified above	31	1,657,123

[1] This number is less than the sum of the numbers shown in the column, for the reason that in many cases a single establishment manufactured more than one class of products.

[2] Represents the value of lighting equipment which certain establishments reporting could not distribute either by class or by kind.

Electric Industrial Trucks and Tractors

October shipments of electric industrial trucks and tractors, as reported to the Department of Commerce by the nine leading manufacturers in the industry were 134, as compared with 118 in September and 109 in October, 1927.

SHIPMENTS OF ELECTRIC INDUSTRIAL TRUCKS AND TRACTORS

(In number of vehicles)

	Total	Domestic—Tractors	Domestic—All Other Types	Exports
1927				
January	90	6	67	17
February	138	11	120	7
March	116	10	96	10
April	105	12	89	4
May	106	19	77	10
June	140	20	97	23
July	90	12	73	5
August	92	3	87	2
September	79	8	66	5
October	109	11	81	17
Total (ten months)	1,065	112	853	100
November	98	15	64	19
December	96	8	77	11
Total (year)	1,259	135	994	130
1928				
January	112	5	98	9
February	119	15	86	18
March	129	18	95	16
April	136	9	121	6
May	114	8	93	13
June	116	6	96	14
July	107	5	87	15
August	96	5	85	6
September	118	11	102	5
October	134	5	109	20
Total (ten months)	1,181	87	972	122

Consumption of Copper Up 18 per Cent

Copper consumption of the United States for 1928 will approximate 1,000,000 tons, according to William G. Schneider of the Copper and Brass Research Association in an address delivered in New York recently before the American Institute of Mining Engineers. The estimate is based on domestic deliveries for the first ten months of the year.

This is a new record for copper consumption, being about 18 per cent above the total for 1927. Consumption in 1927 was about 840,000 tons and about 900,000 tons in 1926. Mr. Schneider estimated the world production of copper for 1928 at 1,840,000 tons, an increase of about 165,000 tons over 1927.

Taking advance sales into account, stocks of refined copper will be about 40,000 tons by Jan. 1, 1929.

Market Conditions

EQUIPMENT business continues on a moderate scale throughout the East, but inquiries and other indicators foreshadow a substantial growth in volume in the near future, in keeping with the steadily expanding volume of construction. In the Eastern district inquiries ranging from wire and cable to heavy equipment show a significant increase. Marine business continues an important factor. In New England certain substantial orders for heavy power equipment are expected to be placed soon. It is also significant that textile concerns are beginning to buy. In the Southeast the bulk of buying is in small equipment.

Farther west the same indications of larger business in the near future are apparent. The St. Louis district records a renewal of activity in the lead mines and reports some sizable orders in control equipment. In the Middle West the utilities have completed most of their construction schedules, but much maintenance and rehabilitation work is under way or promised for the near future.

On the Pacific there is a large volume of small orders and a few large ones, especially in power equipment. The Southern California Edison Company has placed a very substantial order. Altogether this week is by far the best of the month on the Coast.

Zinc Buying Largest For Considerable Period

Buying of zinc this week has been the largest since we have commenced compiling these records. Commitments in lead have also been exceptionally heavy. Tin prices have advanced as a result of recent speculative interest in London.

NEW YORK METAL MARKET PRICES

	Nov. 21, 1928 Cents per Pound	Nov. 28, 1928 Cents per Pound
Copper, electrolytic	16	16
Lead, Am. S. & R. price	6.35	6.35
Antimony	10.125	9.875
Nickel, ingot	35	35
Zinc, spot	6.60	6.6875
Tin, Straits	51.625	52.75
Aluminum, 99 per cent	24.30	24.30

Base copper wire price Nov. 28, 1928, 17¼ cents.

Large Orders Pending in New England

With buying rather quiet in the New England district at present interest is turned to a number of orders of heavy power equipment to be placed soon. These orders include power units for three large hydro-electric projects and a large addition to a prominent utility. Small power units continue to lead in sales and an order for 38 loom motors was received recently from a southern New England weaving plant. Textile companies have resumed buying and have placed a number of orders for small motors and control equipment. A paper company in Maine recently placed an order for motors and control amounting to $8,000 and a prominent manufacturer records sales of a number of single power units consisting of motor and control equipment ranging up to 500 hp. Machine tool manufacturers are buying fractional-horsepower motors in good volume at present.

Central-station supplies are less a feature in the market and small orders are noted for scheduled material. A few transformer orders were recently placed, while line material and substation equipment activity have fallen off gradually. Street lighting negotiations are active.

Small Orders in Good Volume Reported in Southeast

A satisfactorily sustained activity in the electrical field is reported in the Southeast, with the majority of orders individually small or of medium size. A power company in Louisiana placed an order for a 7,500-kva. synchronous condenser with auxiliary equipment, while a company in Alabama ordered oil circuit breaker equipment amounting to $60,000. A Georgia company's wire orders totaled 31,000 lb. of bare copper, 25,000 lb. of weatherproof copper wire and 5,000 lb. of weatherproof cable. The same company ordered creosoted pine poles amounting to $3,100 and pole line hardware totaling $1,100. Some other power company orders were for watt-hour meters costing $3,100, current and distribution transformers amounting to $2,800 and $2,000 in small switching equipment. A small power company in Georgia ordered pole line hardware and general supply materials amounting to $1,100.

Contracts have been let covering the construction of a 20-ton ice plant in a middle Georgia city and this plant is in the market for 100 hp. in motor equipment. Plans have been announced for a kaolin plant addition in South Carolina which will require 700 hp. in additional motor equipment. One manufacturer reports the receipt of several mill orders for varnished cambric cable, which orders aggregated $10,000. A contracting firm in Georgia ordered condulets and general supply materials amounting to $2,000, while another contractor ordered supply lines amounting to $1,000. Construction projects are as follows:

The Virginia Maid Hosiery Mills, Inc., Pulaski, Va., plans a mill to cost $200,000. The Albemarle - Chesapeake Corporation, West Point, Va., will build a power plant at its proposed paper mill, to cost $250,000. The Asheville Silk Hosiery Company, Asheville, N. C., plans a mill to cost $100,000. The Golden Belt Manufacturing Company, Durham, N. C., plans an addition to its hosiery mill to cost $150,000. The Superintendent of Lighthouses, Charleston, S. C., will receive bids until Dec. 18 for two full Diesel marine propelling engines, and one motor-driven air compressor with accessories. The Pearce - Young - Angel Company, Greenville, S. C., plans a cold storage and refrigerating plant to cost $80,000. The Mississippi Power Company, Gulfport, Miss., will build a 44,000-volt transmission line between Picayune and Poplarville, Miss., and plans a 110,000-volt transmission line from Jasper, Ala., to West Point, Miss., and a power substation at the latter place. The Southeastern Production Company, a subsidiary of the Southeastern Power & Light Company, Birmingham, Ala., will build a steam-operated electric power plant at Mobile, Ala., to cost $1,000,000.

Business Continues to Increase in Middle West

Evidence of continued good business is being noticed in most sections of the Middle West. The increase is gradual from month to month and it is expected that December will complete a satisfactory year. Reports from the steel and automotive industries show an excellent condition and industrial activity continues, with a great deal of seasonal demand. The utility companies have completed most of their construction schedules, although a large amount of rehabilitation and maintenance work is going on. Very little apparatus is being purchased and investment budgets are now being prepared for the coming year. Among the interesting orders placed was one for 75 15-kva. and fifteen 37½-kva. pole type distribution transformers. Jobbers' sales continue satisfactory. Construction projects are as follows:

The Gillette Rubber Company, Eau Claire, Wis., plans an addition to its mill to cost $200,000. The Wisconsin-Michigan Power Company, Appleton, Wis., plans a power plant at Weyauwega, Wis., and extensions in transmission lines. The Stinson Aircraft Company, Northville, Mich., plans an addition to cost $165,000. The Fisher Body Corporation, Detroit, plans extensions in its plant at Pontiac, Mich., to cost $750,000. The Lenawee County Light & Power Company, Tecumseh, Mich. (recently organized subsidiary of the Cities Service Company, New York) plans a transmission line from Tecumseh to Adrian, Mich., with a substation. The Commonwealth Edison Company, Chicago, plans a substation on South Western Avenue, to cost $70,000. The Illinois Tool Works, Inc., Chicago, plans an addition to its plant to cost $70,000. The Pines Winterfront Company, Chicago, plans an automobile equipment plant to cost $200,000. Springfield, Ill., will soon take bids for a municipal electric substation to cost $50,000. The Fibroc Insulating Company, Valparaiso, Ind., plans a factory and a power house to cost $100,000. The Board of County Commissioners, Cincinnati, Ohio, contemplates a power plant with mechanical shops, to cost $200,000. The Union Gas & Electric Company, Cincinnati, Ohio, plans a steam-operated power plant to cost $1,500,000. The City Ice & Fuel Company, Cleveland, will build an addition to its ice-manufacturing plant to cost $60,000, and will electrify the plant at Norwood, Cincinnati, to cost $75,000. The Industrial Steel Casting Company, Toledo, Ohio, contemplates a power plant in connection with its foundry addition, to cost $85,000. The

Red River Power Company, Grand Forks, N. D., will build a transmission line to Arvilla, N. D., and vicinity. The Minnesota Valley Canning Company, Montgomery, Minn., will build an addition to cost $100,000. The Central West Public Service Company, Omaha, Neb., plans an ice-manufacturing plant at Sioux City, Iowa, to cost $125,000; and will build a transmission line from White River, S. D., to Murdo, Presho, Chamberlin, S. D., and vicinity. The Iowa Service Company, Lincoln, Neb., plans a steam-operated electric power plant at Storm Lake, Iowa, to cost $100,000. Ottumwa, Iowa, plans a municipal hydro-electric power plant to cost $700,000. The Bettendorf Light & Power Company, Bettendorf, Iowa, plans extensions in transmission lines in the vicinity of Pleasant Valley Township. The Eastern Iowa Electric Company, Dubuque, Iowa, plans extensions in transmission lines in vicinity of Wyoming, Iowa. Cedar Rapids, Iowa, plans an ornamental lighting system. The Northwestern Light & Power Company, Cedar Rapids, Iowa, plans extensions in transmission lines at Battle Creek and Cushing, Iowa, and vicinity. The Interstate Power Company, Dubuque, Iowa, will install an improved street-lighting system at Clinton, Iowa. Dow City, Iowa, plans an addition to its municipal electric lighting plant.

Central-Station Business Improves in Eastern District

Central-station account shows definite tendencies of improvement in the Eastern district. While actual commitments are still of reduced character, the increase in volume of inquiries, ranging from heavy equipment to wire and cable, appears as a forerunner to the revival of sales in this quarter. A power company in New Jersey has arranged specifications for generating machinery for a new project and is expected to be in the market shortly. A prominent manufacturer of wire and cable reports business as improved, while present demand for underground cable from metropolitan utilities shows an upward trend and sizable commitments are expected. The call for wire and cable for overhead installations is still a little light and rather spotty, but the outlook is better.

Marine business continues as an important factor in the present situation and several sizable contracts are in sight. The Sun Shipbuilding & Drydock Corporation, Chester, Pa., will build a 10,000-ton Diesel engine-propelled combined passenger and cargo vessel for the American-South African Line, Inc., New York; all of the engine room and deck auxiliaries will be electrically operated. According to a manufacturer of transformers, the present sales volume is fair and a good uniform pace is being maintained.

Industrial business shows an inclination to ease, excepting in the case of rayon and paper mills. A rayon company in New York has placed awards for a quantity of equipment for a plant in North Carolina, including stokers, air compressors, and refrigerating apparatus. A western Pennsylvania manufacturer has taken an order for a turbine unit for a rayon mill in Georgia, and other contracts have been given for stokers, coal-handling equipment, electric conduit, etc. A fiber mill in Mississippi has placed a commitment with an Eastern maker for a quantity of electrical equipment to cost $100,000. Motor business generally has declined, but early resumption is anticipated. Municipal airport construction is developing a continued demand for flood lighting equipment and beacon lamp units, and the coming year is expected to show an exceptionally heavy account in this line. Street-lighting installations have a good tone for sizable business. Construction projects are as follows:

The Thomas Trading Company, Brooklyn, plans a factory to cost $170,000. The Borden Company, New York, plans an evaporated and powdered milk plant at Waco, Tex., to cost $350,000. The St. Regis Paper Company, Watertown, N. Y., is purchasing property in Cuba and projects a paper mill to cost $600,000. The Western Electric Company, New York, plans a factory at Emeryville, Calif., to cost $500,000. The Dunkirk Radiator Corporation, Dunkirk, N. Y., will build a plant to cost $75,000. The Long Island Lighting Company, New York, will make extensions in its substations and system to cost $1,000,000. The Public Service Electric & Gas Company, Newark, N. J., plans a power switching station at Elizabeth, N. J., to cost $1,000,000. The Collins & Aikman Corporation, Philadelphia, will build a plush mill at Farnham, Que., to cost $100,000. The Scranton School District, Scranton, Pa., plans a central power house to cost $225,000. Morrisville, Pa., plans a fire alarm system. The Board of County Commissioners, Pittsburgh, plans an airport to cost $1,000,000. The Bellanca Aircraft Corporation, New Castle, Del., will make expansions to cost $200,000. The District Commissioners, District of Columbia, Washington, has rejected bids and will ask for new bids for extensions in the power plant at the Massachusetts Avenue hospital, to cost $90,000. The General Purchasing Officer, Panama Canal, Washington, will receive bids until Dec. 11 for storage batteries, cable, fuses, etc. (Panama Schedule 1925). The Bureau of Yards and Docks, Navy Department, Washington, will receive bids (no closing date stated) for automatic refrigerating machinery (Specification 5796.)

Good Business Outlook Noted in St. Louis District

Reports from manufacturers in the St. Louis district indicate that the prospects for good business in the near future are very bright. Orders were placed for synchronous motors with switchboards and control equipment for two ice plants, one for $25,000 and the other for $12,000. A renewal of activity in the lead mines of southeast Missouri is indicated by an order for a lot of 15- to 35-hp. motors aggregating $10,000. A shipment of transformers and switches amounting to over $10,000 is reported for a power company southeast of St. Louis. Jobbers are doing an unprecedented business in all varieties of appliances and shipments of building and other construction materials are holding up in volume remarkably well for the season. Construction projects are as follows:

The Missouri-Pacific Railway Company, St. Louis, plans a power plant at its shops at Wichita, Kan. The American Eagle Aircraft Corporation, Kansas City, Mo., plans a plant to cost $100,000. The Emery-Carpenter Container Company, Cincinnati, Ohio, will build a factory at St. Louis, Mo., for the manufacture of fiber containers, to cost $75,000. The Mid-Continent Lacquer Manufacturing Company, Kansas City, Mo., plans a plant to cost $70,000. The Envelope Manufacturing Company, St. Louis, plans an addition to cost $85,000. The Swallow Airplane Company, Wichita, Kan., plans plant additions to cost $300,000. The Missouri, Kansas & Texas Railway Company, St. Louis, plans locomotive repair shops at Smithville, Tex., to cost $150,000.

Power Companies Buying Equipment on Pacific Coast

Power companies are purchasing actively on the Pacific Coast, including such orders as a $6,000 carload of special combination 45,000 to 60,000-volt porcelain insulators for the Santa Maria district, another 70,000 lb. weatherproof wire order for the Hawaiian Islands, and $5,000 worth of assorted wires and cables for a San Francisco steam plant. A southern California power company has bought $40,000 worth of station transformers, splitting the order among the Wagner, Westinghouse and Allis-Chalmers companies. This is in addition to a previous purchase by the Southern California Edison Company of 149 transformers, and 100,000 gal. of transformer oil has also been bought. Industrial orders include a $3,000 switchboard for south San Francisco and three oil drilling motors which are valued at $4,500 for the Kern fields.

The larger sales of miscellaneous equipment in the Puget Sound district include one 400-hp. motor to a Seattle sawmill; ten 15-hp. machines to a pulp and paper mill at Anacortes, twelve from 150 hp. down for the blower system in a mill at Everett, ten from 75 hp. down for the Grays Harbor pulp and paper plant, three 100-kva. transformers for an airplane factory and one 73,000-volt oil circuit breaker for a central station in the Puget Sound district. Construction projects are as follows:

Fairfield, Calif., plans a municipal electric light and power plant. Glendale Calif., has authorized a bond issue of $200,000, which is to be used for an improved fire alarm system and a central station. The Los Angeles Can Company, Los Angeles, plans a factory to cost $350,000. Redwood City, Merced, San Francisco, Monrovia, Los Angeles and Alameda, Calif., plan ornamental lighting systems. The Empire Development Company, (H. L. Haehl, Humboldt Bank Building, San Francisco, Calif., engineer) plans a hydro-electric power development on the Kern River, Tulare County, Calif., with initial capacity of 150,000 hp., to cost $20,000,000, with transmission lines. The San Dimas Orange Growers' Association, San Dimas, Calif., will build an addition to its ice and precooling plant. The Northwestern Electric Company, Portland, Ore., plans an addition to its steam-operated electric power plant to cost $1,000,000. The Winnipeg Electric Company, Winnipeg, Man., plans a power plant to cost $250,000. The Fort William Paper Company, Fort William, Ont., will make expansions to cost $175,000.

Activities of the Trade

Eidlitz Resigns from Electric Board of Trade

The resignation is announced of Charles L. Eidlitz as chairman of the board of governors of the Electric Board of Trade of New York, Inc., to take effect Dec. 31. This organization was created 5½ years ago by a group of electrical contractors with a view to arresting the impending danger to general building trade welfare of conditions then existing in the contracting and building fields.

The main function of the Electrical Board of Trade, which includes in its membership leading manufacturers' agents and electrical engineering, contracting, jobbing and distributing companies, as well as electrical trade publications, has been to provide the building trades and the public with a clearing house through which inter-trade differences and complaints may be adjusted and to prevent their repetition.

Radio Corporation Has Record Quarter

The Radio Corporation of America announced gross income for the third quarter of the year amounting to $23,643,332. This was from sales, communications, real estate operations and other income for the three months to Sept. 30. Net income for the period, amounting to $5,221,145, was the greatest for any quarter in the company's history and exceeded substantially the net income for the entire year 1926. The net income for the first nine months of 1928 was $9,745,924.

Quarters	Gross Revenues	Net Income
Sept., 1928	$23,643,332	$5,221,145
June, 1928	11,690,679	1,401,905
March, 1928	16,792,547	3,122,874
Dec., 1927	31,553,443	4,336,966
Sept., 1927	16,773,091	3,588,989
June, 1927	6,183,050	425,587
March, 1927	10,572,490	126,778

Carbon Arc Sunshine Lamp Section Added by N.E.M.A.

One of the last acts of the membership committee of the National Electrical Manufacturers' Association in that body's annual fall meeting at Briarcliff Manor recently was the acceptance of a carbon arc sunshine lamp section in the appliance division of the association. E. A. Williford of the National Carbon Company, Cleveland, was chosen chairman of the section. Fourteen of the 30 to 40 manufacturers of carbon arc sunshine lamps are enrolled in the section already. Representatives of the original fourteen members were called together for discussion of the organization by A. E. Waller, director of the National Electrical Manufacturers' Association.

Christmas Lighting Contest

A national Christmas outdoor lighting contest is being sponsored by the Society for Electrical Development, 420 Lexington Avenue, New York City. Leagues, central stations and commercial and civic organizations indicate their willingness to take part. A group of manufacturers has provided a fund of $1,600 to be distributed as prizes. The country has been divided into eleven districts, each of which will be organized by a divisional committee.

Equipment for Glasgow Tramways

Probably the largest order ever placed by a British undertaking has been placed by the Glasgow Corporation with the Metropolitan-Vickers Electrical Company. It covers the supply of electrical equipment for 300 tramcars which are being reconstructed to give greater comfort and service. The new equipment will include motors of the lightweight box frame type, designed by the company to meet the severe conditions which result from increasing and speeding up tramway service. The nominal rating of the motors is 50 hp., 500 volts, 900 r.p.m. They have a full load efficiency through gearing of 85 per cent and exert traction effort at full load of 1,220 lb. per motor. The acceleration given on a car on the level is 3 ft. per second.

Suggest Higher Quality Batteries to Remedy Situation

SOME very pertinent and significant facts were brought out by J. B. Perlman of the Hartford Battery Manufacturing Company in a recent address before the National Battery Manufacturers' Association. Mr. Perlman raised and answered three important main questions, namely, Who will be the manufacturers of storage batteries in the future? What type of product will they manufacture? and Through whom will the product be sold? In answer to the first question, Mr. Perlman pointed out that the battery business does not require an exceedingly large amount of capital to begin, and would therefore entice many small producers. At the same time, he drew attention to the recent trend in all industries toward combinations in big business. The battery business, he indicated, is just beginning to recuperate from a cessation of abnormally good business and large profits which began during the war period and later during the radio boom. The industry is again in a period of reduced demand and with certain manufacturers having production facilities which exceed that required by the business they can obtain, with the consequence that price reductions are to be anticipated. This, in fact, has been the case within the past year, Mr. Perlman pointed out, and he made the statement that it is now difficult for even the largest manufacturers to operate at a profit despite the economies which all have effected. Attention was drawn to the recent consolidations and it was intimated that whether these will result in the elimination of all but a small number of manufacturers will depend greatly upon the demand for the product and the price at which it is being generally sold.

Answering the second question, Mr. Perlman pointed out that the recent trend is toward lower-priced batteries, and he stated that the problem confronting the engineering department of a factory has been not "how good" but "how cheaply can we produce the product?" Whether or not the public will demand a better type of battery or whether the movement just referred to will continue remains to be seen. Mr. Perlman concluded: "At what price will the tide stop and shift the other way and tend toward improvement in design and quality?" Possibly the time is right now for some manufacturer to eliminate price in the sale of his product and instead solicit business on the basis of quality. At the present time, although good batteries are still made, little effort is directed toward their sale, and it may be that merchandising efforts can profitably be directed toward bringing the public over to the purchase of a super-product.

THE PAGE & HILL COMPANY, Minneapolis, producer of Northern white and Western red cedar poles, announces the opening of an office at 733 Public Service Building, Boston, in charge of Rodgers G. Wheaton.

THE ELECTRIC HOIST MANUFACTURERS' ASSOCIATION, 165 Broadway, New York City, announces that it will hold its next regular meeting on Thursday, Dec. 20, at the Hotel McAlpin, New York City.

THE EDISON ELECTRIC APPLIANCE COMPANY, INC., 5600 West Taylor Street, Chicago, has recently placed on the market its advanced model "Hotpoint" de luxe automatic electric range. This range is of all white enamel and is distinguished by an attractive black striping.

THE ELECTRIC STORAGE BATTERY COMPANY, Allegheny Avenue and Nineteenth Street, Philadelphia, manufacturer of "Exide" batteries, announces the appointment of Albert N. Dingee as

advertising manager of its company to succeed the late Alfred B. Kreitzburg. Mr. Dingee has been in the sales department of the company for the past eighteen years.

WAGNER ELECTRIC TO EXPAND.—It is understood that the Wagner Electric Corporation, St. Louis, has under consideration the erection of a new building for the manufacture of all types, in which the latest machinery and most advantageous shop arrangement will contribute to a high quality of manufacturing detail.

THE ELECTRIC MACHINERY MANUFACTURING COMPANY, Minneapolis, manufacturer of synchronous motors and vertical alternators, announces that A. B. King, formerly in charge of the Eastern sales for the company with headquarters at New York, has resigned to become president of the A. C. Morse Company of New Haven, Conn. The A. C. Morse Company is sales representative for the Electric Machinery Manufacturing Company at New Haven.

HOME-LIGHTING COURSE. — A successful home-lighting course was held by the National Lamp Works, Nela Park, Cleveland, on Nov. 17. The total attendance was thirty-five, including representatives of large central stations throughout the country as well as lighting specialists from Japan, Sweden and Canada. A number of central stations are conducting shade classes as part of their public relations work, and a representative of one of these companies, Mrs. Ella Smethers of the Ohio Public Service Company, related in detail many of her company's experiences in connection with this activity. Another interesting session was that devoted to the subject of "Light for Party Decoration," discussed by Mrs. Frances Rosenberg, Commonwealth Edison Company.

MAXIMUM OUTPUT TRANSFORMER.—The maximum output ever concentrated in one transformer unit is probably represented in the 83,333-kva. auto-transformer which has been built at the Pittsfield works of the General Electric Company for use in the Charles R. Huntley station of the Buffalo General Electric Company. The unit is rated three phase, water cooled, 25 cycles, 83,333 kva. output, 24,500Y-12,000Y volts. Based on its equivalent transformer capacity of 49,200 kva., it required parts that could be used in building a 60-cycle, two-winding transformer rated at about 100,000 kva. at the same voltage. The high voltage or series winding consists of two separate circuits, each of which is connected to a separate section of the station bus. Such an arrangement limits the current that can flow during a short circuit on the system. Each circuit is designed to carry not only half the total load, or 41,667 kva., but also, under unbalanced conditions, a maximum of 55,000 kva., with the load on the other circuit not exceeding 28,333 kva. Instead of the standard three-legged core, use is made of the five-legged core so as to keep the height down to a minimum for shipment and to facilitate end-sheeting during assembly.

New Equipment Available

Solderless Connector for Transformers

For use on distribution transformers employing solid studs instead of flexible leads, the Delta-Star Electric Company of Chicago has designed a solderless

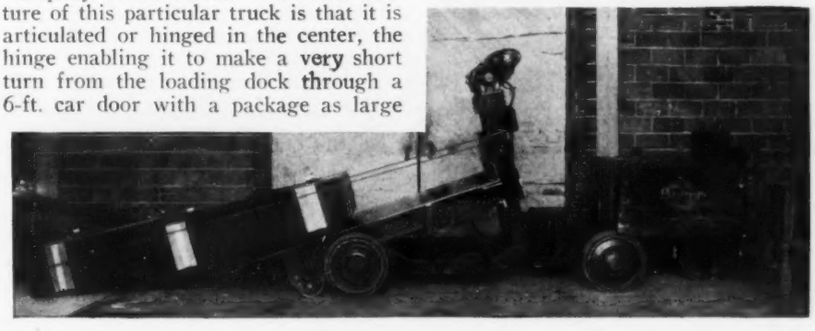
type of connector. The application of this connector to a transformer made by the Wagner Electric Corporation is shown in the accompanying illustration.

Portable Electric Drill

A ⅜-in. portable electric drill adapted to general repair work has just been brought out by the Wodack Electric Tool Corporation of Chicago. Its weight is 7½ lb. and it is equipped with a General Electric universal motor of the variable speed type, controlled by a trigger switch of 100 per cent oversize. Besides drilling, it can be used for driving and buffing and other odd jobs.

Electric Truck to Load Box Cars

An electric storage battery truck which will load 10-ton packages of sheet steel into box cars has been perfected recently by the Baker-Rauling Company of Cleveland. The new feature of this particular truck is that it is articulated or hinged in the center, the hinge enabling it to make a very short turn from the loading dock through a 6-ft. car door with a package as large as 48 in. wide and 102 in. long. The power section of the truck carries the battery and the driving and steering apparatus. The load section consists of a tilting platform mounted on a single axle and includes the hoist for tilting the platform and a double drum power winch.



Edgewise-Wound Resistor

An edgewise-wound resistor, type EW, suitable for electric locomotives, motor cars or trolley buses, has been announced by the General Electric Company. Made of non-corrosive metal, it employs several taps to permit the use of a variety of resistance values. Use is made in the resistor of a new type of resistance material that has a high tensile strength and a temperature coefficient of resistance approximately one-quarter that of cast iron.

Water-Tight Motor

For purposes of hoist duty, where exposed to the elements, a water-tight motor has been developed by Roth Brothers Company, Chicago. It is rated at 1,500 hp., 1,150 r.p.m., 30 minutes duty and is reversible, compound wound and equipped with ball bearings. It is intended for direct current operation.

The bracket on the commutator end has four hand hole covers, removable to permit access to the brushes, brush rigging and commutator. These covers are bolted in place and fitted with rubber gaskets.

Oil Circuit Breaker for Small Installations

A new oil circuit breaker for small and isolated installations is announced by the General Electric Company. The device is rated 4,500 volts, 200 and 400 amp., two, three and four poles, single and double throw, and has interrupting capacities of approximately 20,000 kva. at rated voltage. This type of circuit breaker is recommended for use in small plant and industrial installations and for stations where substantial and reliable breakers of modern interrupting capacity are required.

Electrical Patents

Announced by U. S. Patent Office

(Issued Nov. 13, 1928)

1,691,222. SPEED-CONTROL MEANS FOR HIGH-FREQUENCY GENERATORS; P. Böhn, Berlin, Germany. App. filed April 2, 1926.

1,691,231. PLUG; O. C. Dudley, Canton, N. C. App. filed Oct. 14, 1924.

1,691,244. HAIR-CURLING IRON; E. K. Hussey, Oakland, Calif. App. filed April 26, 1926.

1,691,252. ELECTRIC SWITCH; G. B. Reisbach, San Diego, Calif. App. filed Nov. 9, 1925.

1,691,255. CONDUIT FITTING; H. A. Selah, Erie, Pa. App. filed Nov. 30, 1925.

1,691,272 and 1,691,273. METHOD OF PRODUCING METALS AND METAL ALLOYS LOW IN CARBON; H. G. Flodin, Roslags-Nasby, Sweden. Apps. filed March 18, 1924 and June 22, 1925.

1,691,274. METHOD OF PRODUCING DENSE IRON AND IRON ALLOYS DIRECTLY OUT OF OXIDE ORES; H. G. Flodin, Roslags-Nasby, Sweden. App. filed June 22, 1925.

1,691,291. SWITCH; J. K. Kahaleohu, Honolulu, Territory of Hawaii. App. filed Feb. 19, 1927.

1,691,316. METHOD OF PROTECTING HIGH-TENSION LINES AGAINST FLASHOVERS; A. Vaupel, Berlin-Grunewald, Germany. App. filed Feb. 26, 1925.

1,691,327. TERMINAL FOR BUSHINGS; A. O. Austin, Barberton, Ohio. App. filed July 29, 1922.

1,691,328. TERMINAL FOR INSULATOR BUSHINGS; A. O. Austin, Barberton, Ohio. App. filed Aug. 3, 1922.

1,691,329. HIGH-TENSION INSTALLATION; A. O. Austin, Barberton, Ohio. App. filed Oct. 20, 1921.

1,691,330. INSULATOR; A. O. Austin, Barberton, Ohio. App. filed April 6, 1921.

1,691,340. METHOD AND SYSTEM FOR PROTECTING PETROLEUM TANKS AND TANK FARMS AGAINST LIGHTNING; W. Dodd, Des Moines, Iowa. App. filed May 15, 1926.

1,691,342. MEASURING INSTRUMENT; R. D. Evans, Wilkinsburg, Pa. App. filed July 31, 1924.

1,691,349. HIGH-FREQUENCY INDUCTION FURNACE; G. F. Harrington, Edgewood, and P. H. Brace, Wilkinsburg, Pa. App. filed June 1, 1927.

1,691,354. ELECTRICAL MEASURING INSTRUMENT; B. G. La Par, Turtle Creek, Pa. App. filed Sept. 8, 1924.

1,691,356. INSULATING BUSHINGS AND METHOD OF MAKING THE SAME; M. Morrison, Chicago, Ill. App. filed Sept. 13, 1923.

1,691,357. ELECTRICAL MEASURING INSTRUMENT; W. G. Mylius, Wilkinsburg, Pa. App. filed Aug. 30, 1924.

1,691,360. CONTROL SYSTEM; M. E. Reagan, Pittsburgh, Pa. App. filed June 6, 1924.

1,691,361. TOASTER; E. W. Roberts, Cincinnati, Ohio. App. filed June 6, 1927.

1,691,363. SIGNALING DEVICE; W. Sparks, Jackson, Mich. App. filed March 20, 1924.

1,691,365. ELECTRIC FURNACE; J. C. Woodson, Mansfield, Ohio. App. filed Jan. 19, 1927.

1,691,377. AUTOMATIC STATION; C. A. Butcher, Forest Hills, Pa. App. filed March 18, 1927.

1,691,395. CIRCUIT-CONTROL APPARATUS; I. Langmuir, Schenectady, N. Y. App. filed Aug. 16, 1926.

1,691,401. ART OF USING DIRECT METAL FROM BLAST FURNACES; R. Moldenke, Watchung, N. J. App. filed Dec. 19, 1924.

1,691,421. HEATING DEVICE FOR AIR-CIRCULATING FANS; S. A. Xippas, Buffalo, N. Y. App. filed April 29, 1927.

1,691,422. PANEL-BOARD BOX; C. Aalborg, Pittsburgh, Pa. App. filed Sept. 16, 1921.

1,691,423. CIRCUIT-CONTROL APPARATUS; E. F. W. Alexanderson and A. H. Mittag, Schenectady, N. Y. App. filed May 20, 1926.

1,691,434. ELECTRIC IRON; S. Dworkin, Philadelphia, Pa. App. filed Aug. 11, 1925.

1,691,436. SEAL FOR HARD GLASS; W. B. Gero, Bloomfield, N. J. App. filed July 28, 1926.

1,691,439. PROCESS FOR PRODUCING METALS IN ELECTRIC FURNACES; E. G. T. Gustafsson, Stockholm, Sweden. App. filed March 31, 1926.

1,691,447. RECTIFIER AND CONNECTION THEREFOR; M. Schiesser, Baden, Switzerland. App. filed Oct. 21, 1927.

1,691,472. ELECTRICALLY-HEATED GARMENT; W. D. Graham, River Forest, and C. M. Uhlig, Chicago, Ill. App. filed June 25, 1925.

1,691,486. AUTOMATIC ELECTRIC WELDING MACHINE; J. Ledwinka, Philadelphia, Pa. App. filed Dec. 13, 1920.

1,691,505. ELECTRODE; M. Walther, Oslo, Norway. App. filed May 14, 1926.

1,691,522. METHOD OF ELECTRIC RIVETING; F. P. Kobert, Amityville, N. Y. App. filed Jan. 22, 1921.

1,691,551. CHANGEABLE EXHIBITOR; W. C. Martin, Chicago, Ill. App. filed May 12, 1922.

1,691,562. APPARATUS FOR ELECTRICALLY HEATING METAL PARTS; R. E. Bissell, Cleveland Heights, Ohio. App. filed Nov. 17, 1926.

1,691,578. MEANS FOR SEPARATING ASSOCIATED LIQUIDS; C. W. McKibben, Houston, Texas. App. filed April 8, 1926.

1,691,618. SPEED INDICATOR AND REGULATOR FOR ELECTRIC MOTORS; G. von Arco, W. Schaffer and W. Moser, Berlin, Germany. App. filed Jan. 16, 1925.

1,691,627. ELECTRIC FLATIRON; W. A. De Hart, Teaneck, N. J. App. filed June 16, 1923.

1,691,666. CONTROL FOR ELECTRIC CIRCUITS; G. Muffly, Detroit, Mich. App. filed Nov. 26, 1926.

1,691,675. DROP-CORD ROSETTE; E. G. Smith, Syracuse, N. Y. App. filed Sept. 20, 1923.

1,691,696. DYNAMO-COOLING SYSTEM; F. G. Baum, San Francisco, Cal. App. filed Dec. 6, 1927.

1,691,699. TRANSFORMER AND INDUCTANCE; A. D. Cardwell, Rockville Center, N. Y. App. filed May 16, 1925.

1,691,700. MEANS FOR VARIABLY CONTROLLING ELECTRICAL INSTRUMENTS; A. D. Cardwell, Rockville Center, N. Y. App. filed June 27, 1925.

1,691,705. PROTECTOR; W. L. Cook, Chicago, Ill. App. filed Nov. 29, 1926.

1,691,719. DEPTH METER; C. F. Jenkins, Washington, D. C. App. filed Sept. 29, 1923.

1,691,731. ELECTRIC WATER PURIFIER; W. M. Myers, St. Joseph, Mo. App. filed May 21, 1927.

1,691,735. ELECTRICAL CONTROLLER; F. H. Oberschmidt, Cleveland, Ohio. App. filed March 22, 1924.

1,691,747. ALTERNATING-CURRENT MOTOR; H. Weichsel and B. McCormick, St. Louis, Mo. App. filed Jan. 14, 1926.

1,691,749. ELECTRIC HEATER; J. A. Williams and E. Lequornik, Richmond Hill, N. Y. App. filed Nov. 24, 1926.

1,691,751. INSULATED CONTROL; A. O. Austin, Barberton, Ohio. App. filed Aug. 11, 1924.

1,691,778. METHOD OF FORMING VALVE TAPPETS; C. B. McDonald, Detroit, Mich. App. filed April 18, 1927.

1,691,779. VALVE TAPPET AND METHOD OF FORMING THE SAME; C. B. McDonald, Detroit, Mich. App. filed March 19, 1928.

1,691,794. STORAGE BATTERY; J. L. Woodbridge, Philadelphia, Pa. App. filed Sept. 30, 1925.

1,691,798. INDICATOR FOR ELEVATORS OR THE LIKE; H. F. Cypser, Jersey City, N. J. App. filed Dec. 16, 1926.

1,691,805. TROLLEY HARP AND WHEEL ASSEMBLY; T. Haulton, Johnstown, Pa. App. filed Dec. 19, 1927.

1,691,806. ELECTROLYTIC RECTIFIER; W. E. Holland, Philadelphia, Pa. App. filed Jan. 13, 1923.

1,691,813. APPARATUS FOR ELECTRICALLY TRANSMITTING SIGNALS INDICATING RESULTS OF OBSERVATION; H. Karabetz, Vienna, Austria. App. filed Dec. 19, 1925.

1,691,817. COUPLING; C. Kosnick, New York, N. Y. App. filed Jan. 25, 1926.

1,691,820. ENGINE STARTER; R. P. Lansing, Montclair, N. J. App. filed Jan. 20, 1926.

1,691,835. REGISTER; J. S. Winer, Sturgis, Mich. App. filed March 27, 1925.

1,691,836. ELECTRIC CIGAR AND PIPE LIGHTER WITH EXCHANGEABLE INCANDESCENT BODY; H. Agatz, Berlin-Friednau, Germany. App. filed April 6, 1926.

1,691,837. HIGH-TENSION SWITCH MECHANISM; D. Beattie, Greensburg, Pa. App. filed Jan. 13, 1926.

1,691,853. ROTARY ELECTRIC ENGINE; E. M. Mollett, Sacramento, Calif. App. filed Dec. 22, 1927.

1,691,869. ELECTRICAL CONDUCTOR; F. F. Fowle, Chicago, Ill. App. filed July 3, 1924.

1,691,877. VACUUM-TUBE SOCKET; M. Alden, Springfield, Mass. App. filed June 11, 1926.

1,691,901. ELECTRICAL CONDENSER; A. Nyman, New York, N. Y. App. filed March 11, 1926.

1,691,909 and 1,691,910. VOLTAGE REGULATOR; G. B. Crouse, Woodcliff, and J. L. Jatlow, Elizabeth, N. J. Apps. filed Sept. 8, 1926.

Information on foreign patents can be obtained through the nearest district office of the Bureau of Foreign and Domestic Commerce, Department of Commerce.

New Trade Literature

CAPNUT TERMINAL.—The G & W Electric Specialty Company, 7780 Dante Avenue, Chicago, is distributing a supplement leaflet to catalog No. 27 covering the G&W type T capnut terminal for pothead. This terminal is used for general installation outdoors or indoors on single or multiple conductor cable.

DISTRIBUTION TRANSFORMERS.—Leaflet No. L-20,331-A issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., covers its types SC and SCT distribution transformers.

AMMETER.—Supplement No. 1 to bulletin No. 450 issued by the Roller-Smith Company, 233 Broadway, New York City, describes and illustrates its type HEA-3 ammeter for three-phase alternating-current circuits.

FITTING.—A pamphlet issued by the Chicago-Jefferson Fuse & Electric Company, 1500 South Laflin Street, Chicago, covers the new type MF gem powerlet service entrance fitting.

MOTORS.—Bulletin No. 2-1 issued by the Century Electric Company, 1806 Pine Street, St. Louis, describes and illustrates the Century type RS repulsion-start induction single-phase motors. The company also is distributing bulletin No. 7-3 covering its squirrel-cage induction polyphase motors, three-phase and two-phase, type SC, and also a pamphlet containing engineering information on the selection of motors and control.

PANELBOARDS AND STEEL CABINETS.—Bulletin No. 37 issued by the Frank Adam Electric Company, St. Louis, describes and illustrates its new flush service switch panelboard for residences. The company also is distributing bulletin No. 43 covering its type NRT safety type panelboards and cabinets and bulletin No. 44 describing its type NR and R safety type residence panelboards. A bulletin giving complete specifications for wiring the home for comfort and convenience and a circular describing the Frank Adam major system of lighting control, which is adapted to theaters, are included.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Lahore, India (No. 34,572), for storage batteries.

Purchase and agency are desired in Quebec, Canada (No. 34,541), for household electrical appliances.

An agency is desired in Melbourne, Australia (No. 34,535), for household electrical appliances.

An agency is desired in Chemnitz, Germany (No. 34,549), for household electrical appliances.

Purchase is desired in Hamburg, Germany (No. 34,531), of automobile incandescent lamps.

Purchase is desired in Montreal, Canada (No. 34,577), of electrical scraping and polishing machines.

Purchase and agency are desired in Rosario, Argentina (No. 34,582), for electrical washing machines.

Purchase and agency are desired in Nishi-ku, Japan (No. 34,569), for insulated wire, 5,000 ft. monthly.

D. Zimmerman, operating a company in Beirut, Syria, under the name of the Syria Auto and Electric Company Federal, Inc., wishes to obtain agencies in Syria for electrical appliances, wiring devices, radio equipment, farm lighting plants and a low-priced line of electric light fixtures. Mr. Zimmerman can be reached at 1920 Arlington Place, Madison, Wis., until Jan. 1, 1929 and after that until Jan. 10, 1929 in care of the General Motors Export Corporation, 1775 Broadway, New York City. The Electrical Equipment Division in Washington will be glad to forward any material to Mr. Zimmerman at any time.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Man's Strength, Forty-Fold

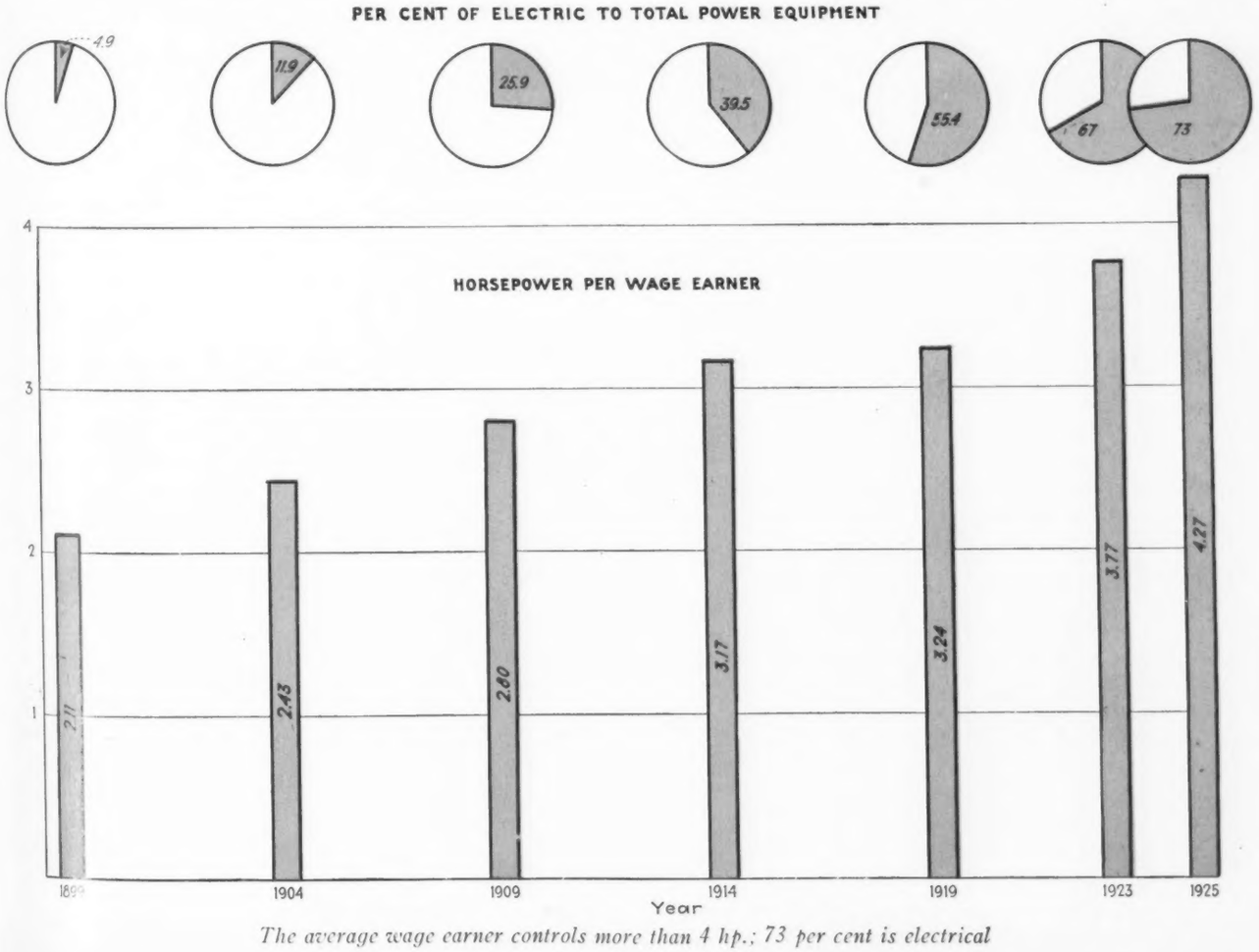
MANUFACTURING establishments of the country today use more than 50 times as much electric power equipment as they did at the beginning of the century, electric motors installed in factories in 1925 aggregating 26,123,573 hp. as against 492,936 hp. in 1899. But while the 492,936 hp. of electric motors in 1899 constituted only 4.9 per cent of the total of installed power, the 26,123,573 hp. aggregate of electric motors in 1925 represented 73 per cent of all installed power, and indications are that this growth has continued.

A significant change in the use of electric power for manufacturing, however, is noticeable in the growing trend toward increasing use of purchased current; that is, current supplied by central electric power stations, instead of the original method of generating the current in the establishment where it was to be used. In 1899 public utilities furnished the current to drive electric motors aggregating 182,562 hp., out of a total motor equipment of 492,936 hp.; that is, 1.8 per cent of the total installed power equipment was run by purchased current and 3.1 per cent consisted of motors run by "home-made" current. In 1925 the proportion was almost reversed, the utilities supplying motors aggregating 15,868,828 hp. with current, or 44.3 per cent of the total primary power, while factory-generated current was used for motors aggregating 10,254,745 hp., or 28.7 per cent of the total installed primary power equipment aggregating 35,772,628 hp.

Attention is called to these conclusions, drawn from the published statistics of the Census of Manufactures for 1925, in a recent bulletin of the National Industrial Conference Board. The census figures were summarized in the ELECTRICAL WORLD of Aug. 13, 1927, and presented graphically in the eight-page insert of the issue of Oct. 1, 1927.

The relative extent to which the major divisions of the manufacturing industries depend upon the public utilities for their electric current is indicated by the percentage the horsepower of motors driven by purchased current bears to the total horsepower of electric motors installed, set forth in the following table:

Industry	Per Cent
Miscellaneous industries	85.1
Food (and kindred products)	75.4
Metals and metal products	72.6
Railroad repair shops	69.1
Rubber products	68.7
Transportation equipment	68.5
Machinery	67.1
Stone, clay and glass products	67.0
Textiles and textile products	61.3
Chemicals and allied products	59.2
Leather and its manufactures	59.1
Paper and printing	53.5
Tobacco manufactures	52.7
Lumber and kindred products	51.1
Iron and steel	45.2
Musical instruments, phonographs, etc.	43.8



The average wage earner controls more than 4 hp.; 73 per cent is electrical

New England Productive Operations Over Last Year

THE rate of general production in the manufacturing plants of the New England States during October was on a plane about 3.4 per cent over September and 4.7 per cent over October last year. The October rate of manufacturing operations in the section has been exceeded only twice, both instances being in the month of February, which is normally the peak month of operations in the New England States. There seems to be every indication at the present time that the average rate of operations in the manufacturing plants of the section will exceed that of any previous year. The average rate of productive activity for the first ten months of the current year, however, is just slightly under that during the same period last year.

The outstanding factors in New England manufacturing operations during the past two months have been the continued high rate of operations witnessed by the metal industries and the upward trend prevalent in the textile plants of the section.

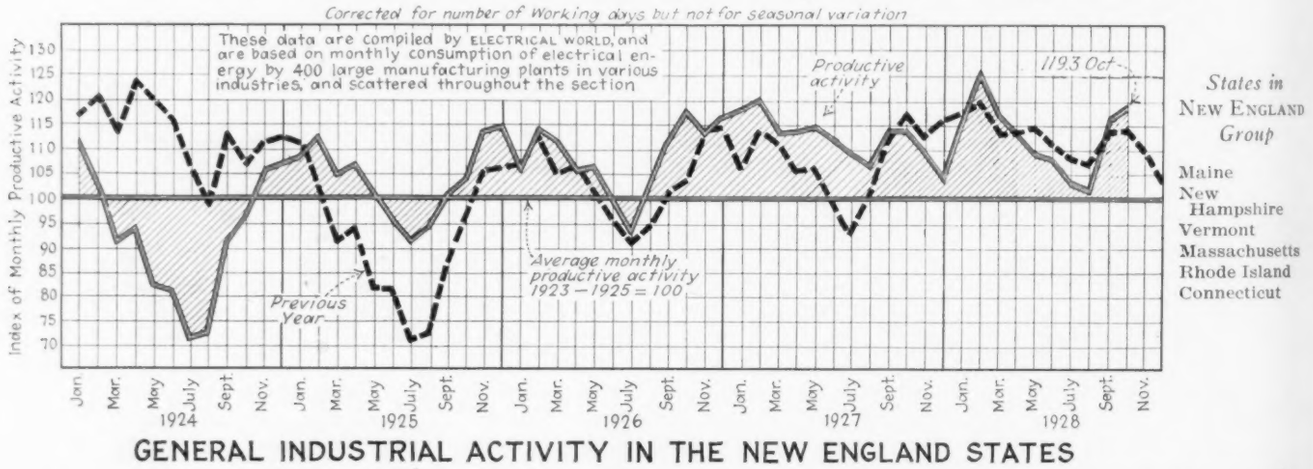
The metal industries of the section during October were operating at a rate 26 per cent over October last year and 30 per cent over the 1928 low month of May. The textiles industry of the section recorded its low point of activity in July and has been on the upward trend since July. The October rate of operations in the textile plants, however, was still 12 per cent under last year. There is reason to believe that the closing two months of the year will witness increased twelve-month operations in the textile plants.

Indexes of Productive Activity in the New England States

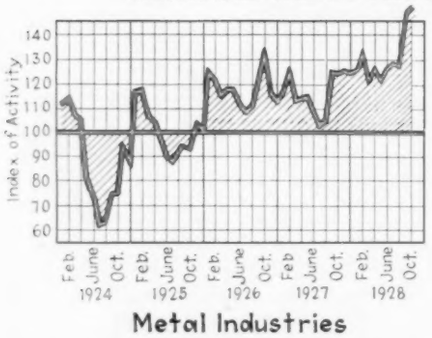
All Figures Adjusted for Number of Working Days

	October, 1928	September, 1928	October, 1927	Average for First Ten Months, 1928	Average for First Ten Months 1927
All industry	119.3	115.3	114.0	112.8	113.5
Chemical and allied products	122.5	123.0	92.2	126.0	117.1
Leather and its products	80.0	77.3	99.7	86.6	95.5
Lumber and its products	78.3	75.5	113.2	96.9	.....
Metals group	156.7	154.2	124.6	132.5	115.7
Rolling mills and steel plants	197.2	194.5	.....	.....	.....
Metal-working plants	140.5	138.2	.....	.....	.....
Paper and pulp	126.0	119.0	120.5	125.5	121.1
Rubber products	144.8	150.0	111.2	127.2	112.3
Textiles	89.4	85.2	114.7	94.1	115.6

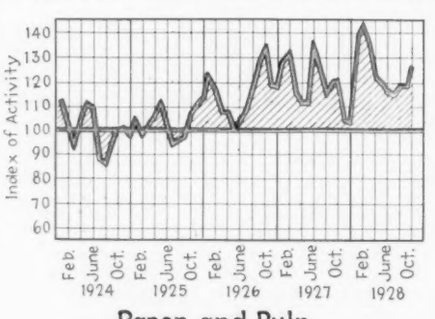
ELECTRICAL WORLD *Barometer of Industrial Activity in the New England States*


Corrected for number of Working days but not for seasonal variation
These data are compiled by ELECTRICAL WORLD, and are based on monthly consumption of electrical energy by 400 large manufacturing plants in various industries, and scattered throughout the section
Productive activity
1193 Oct.
Average monthly productive activity 1923—1925 = 100
Previous Year
Index of Monthly Productive Activity
States in NEW ENGLAND Group
Maine
New Hampshire
Vermont
Massachusetts
Rhode Island
Connecticut
Jan. Mar. May July Sept. Nov.
1924 1925 1926 1927 1928

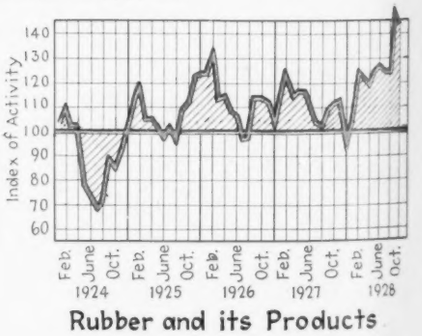
GENERAL INDUSTRIAL ACTIVITY IN THE NEW ENGLAND STATES



Metal Industries

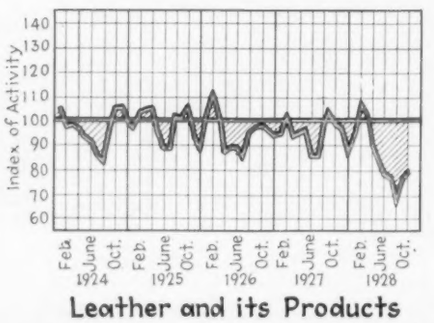


Paper and Pulp

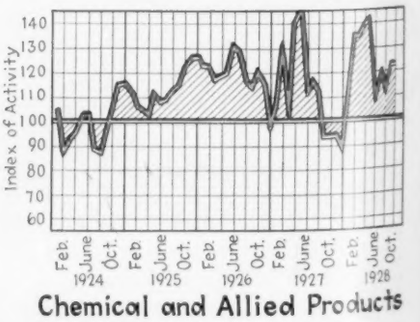


Rubber and its Products

Textiles Industry



Leather and its Products



Chemical and Allied Products

PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE NEW ENGLAND STATES